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DIVISION OF OCCUPATIONAL HEALTH AND SAFETY

ENVIRONMENTAL RADIOACTIVITY LEVELS
SEQUOYAH NUCLEAR PLANT
ANNUAL REPORT - 1981
TVA/OMS/OHS-82/8

April 1982

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CONTENTS

	Page
List of Tables	iii
List of Figures	iv
Introduction	1
Atmospheric Monitoring	11
Terrestrial Monitoring	25
Reservoir Monitoring	41
Quality Control	55
Data Analysis	55
Conclusions	55

List of Tables

Page

Table 1 - Environmental Radioactivity Sampling Schedule 4
Table 2 - Atmospheric and Terrestrial Monitoring Station Locations - Sequoyah Nuclear Plant 5
Table 3 - Detection Capabilities for Environmental Sample Analysis. 6
Table 4 - Results Obtained in Interlaboratory Comparison Program 8
Table 5 - Maximum Permissible Concentrations for Nonoccupational Exposure 13
Table 6 - Radioactivity in Air Filter 14
Table 7 - Radioactivity in Rainwater. 15
Table 8 - Radioactivity in Heavy Particle Fallout 16
Table 9 - Radioactivity in Charcoal Filters 17
Table 10 - Radioactivity in Atmospheric Moisture 18
Table 11 - Radioactivity in Milk 28
Table 12 - Radioactivity in Vegetation 29
Table 13 - Radioactivity in Soil 30
Table 14 - Radioactivity in Well Water 31
Table 15 - Radioactivity in Public Water Supply. 32
Table 16 - Environmental Gamma Radiation Levels. 33
Table 17 - Radioactivity in Food Crops 34
Table 18 - Radioactivity in Poultry. 38
Table 19 - Sampling Schedule - Reservoir Monitoring. 43
Table 20 - Radioactivity in Surface Water, Total 44
Table 21 - Radioactivity in White Crappie (Flesh). 45
Table 22 - Radioactivity in Channel Catfish (Flesh). 46
Table 23 - Radioactivity in Smallmouth Buffalo (Flesh) 47
Table 24 - Radioactivity in Smallmouth Buffalo (Whole) 48
Table 25 - Radioactivity in Sediment 49
Table 26 - Radioactivity in Shoreline Sediment 50
Table 27 - Radioactivity in Clam Flesh 51
Table 28 - Radioactivity in Clam Shell 52

List of Figures

Page

Figure 1 - Tennessee Valley Region 3

Figure 2 - Atmospheric and Terrestrial Monitoring Network. 19

Figure 3 - Local Monitoring Stations - Sequoyah Nuclear Plant. 20

Figure 4 - Sequoyah Nuclear Plant - Site Monitoring Stations 21

Figure 5 - TLD Locations - Sequoyah Nuclear Plant. 22

Figure 6 - Annual Average Gross Beta Activity in Air Filters, Sequoyah Nuclear Plant 23

Figure 7 - Annual Average Gross Beta Activity in Drinking Water, Sequoyah Nuclear Plant 39

Figure 8 - Direct Radiation Levels, Sequoyah Nuclear Plant 40

Figure 9 - Direct Radiation Levels, Sequoyah Nucler Plant, 4-Quarter Moving Average 40

Figure 10 - Reservoir Monitoring Network - Sequoyah Nuclear Plant 53

Figure 11 - Annual Average Gross Beta Activity in Surface Water, Sequoyah Nuclear Plant 54

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ENVIRONMENTAL RADIOACTIVITY LEVELS

SEQUOYAH NUCLEAR PLANT

ANNUAL REPORT

1981

Introduction

The Sequoyah Nuclear Plant (SQN), operated by the Tennessee Valley Authority, is located on a site owned by TVA containing 525 acres of land in Hamilton County, Tennessee, bounded on the east by Chickamauga Reservoir (see figure 1). The site is 12 miles (19.3 kilometers) northeast of Chattanooga, Tennessee, and 11 miles (17.7 kilometers) west-northwest of Cleveland, Tennessee. The plant consists of two pressurized water reactors; each unit is rated at 3,423 MWt and 1,171 MWe. Fuel was loaded in unit 1 on March 1, 1980, and the unit achieved criticality on July 5, 1980. Fuel was loaded in unit 2 in July 1981 and the unit achieved initial criticality on November 5, 1981. This report describes the environmental radiological monitoring conducted in 1981.

The preoperational environmental monitoring program established a baseline of data on the distribution of natural and manmade radioactivity in the environment near the plant site. However, seasonal, yearly, and random variations in the data were observed. In order to determine the potential increases in environmental radioactivity levels caused by the plant, comparisons were made between data for indicator stations (those near the plant) and control stations (those remote from the plant) in conjunction with comparisons with preoperational data.

Staffs in the Division of Occupational Health and Safety and the Office of Natural Resources carried out the sampling program outlined in tables 1 and 19. Sampling locations are shown in figures 2, 3, 4, and 10, and table 2 describes the locations of the atmospheric and terrestrial monitoring stations. All the radiochemical and instrumental analyses were conducted in TVA's Western Area Radiological Laboratory (WARL) located at Muscle Shoals, Alabama, and Eastern Area Radiological Laboratory (EARL) at Vonore, Tennessee, with the EARL being the primary laboratory for samples from SQN. Alpha and beta analyses were performed on Beckman Low Beta II, Beckman Wide Beta II, and Tennelec LB 5100 low background proportional counters. Nuclear Data (ND) Model 100 multichannel analyzer systems employing sodium iodide, NaI(Tl) detectors and ND Model 4420 Systems in conjuction with Germanium, Ge(Li) detection systems were used to analyze the samples for specific gamma-emitting radionuclides. At EARL, a ND Model 6620 system is used with both types of detectors. Samples of water, vegetation, air particulates, food crops, and charcoal (specific analysis for ^{131}I) are routinely counted with NaI(Tl) detection systems. If significant concentrations of radioisotopes are identified, or if there is a reasonable expectation of increased radioactivity levels (such as during periods of increased fallout), these samples are counted on the Ge(Li) system. Identification of gamma-emitting radionuclides in all other types of samples is routinely performed by analysis on the Ge(Li) system. TVA-fabricated and

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Tennelec beta-gamma coincidence counting systems are utilized for the determination of ^{131}I concentrations in milk. Tritium determinations are made with Beckman LS150, Beckman LS100C, and Packard Model 3250 liquid scintillation counting systems.

Data were entered in computer storage for processing specific to the analysis conducted. A computer, employing an ALPHA-M least-squares code, using multimatrix techniques was used to estimate the activities of the gamma-emitting nuclides analyzed by NaI(Tl). The data obtained by Ge(Li) detectors were resolved by the appropriate analyzer software and the metric minimization routine HYPERMET.

The detection capabilities for environmental sample analysis given as the nominal lower limits of detection (LLD) are listed in table 3. Samples processed by NaI(Tl) gamma spectroscopy were analyzed for 14 specific gamma-emitting radionuclides and radionuclide combinations[a]. For these analyses, radionuclide combinations such as $^{103,106}Ru$ and ^{95}Zr-Nb are analyzed as one radionuclide. All photopeaks found in Ge(Li) spectra were identified and quantified. Many of the isotopes identified by Ge(Li) spectral analysis are naturally occurring or naturally produced radioisotopes, such as ^{7}Be, ^{40}K, ^{212}Bi, ^{214}Bi, ^{212}Pb, ^{214}Pb, ^{226}Ra, etc. LLDs for the analysis of the radionuclides listed below[a] are given in table 3B. LLDs for additional radionuclides identified by Ge(Li) analysis were calculated for each analysis and nominal values are listed in the appropriate data tables. In the instance where an LLD has not been established, an LLD value of zero was assumed. A notation in a table of "__ values <LLD" for an isotope with no established LLD does not imply a value less than 0; rather it indicates that the isotope was not identified in that specific group of samples. For each sample type, only the radionuclides for which values greater than the LLD were reported are listed in the data tables.

TVA's Radioanalytical Laboratories participate in the Environmental Radioactivity Laboratory Intercomparison Studies Program conducted by EPA-Las Vegas. This program provides periodic cross-check samples of the type and radionuclide composition normally analyzed in an environmental monitoring program. Routine sample handling and analysis procedures were employed in the evaluation of these samples. The results received during calendar year 1981 are shown in table 4. The $\pm 3\sigma$ limits based on one measurement were divided by the square root of 3 to correct for triplicate determinations.

---

[a]The following radionuclides and radionuclide combinations are quantified by the ALPHA-M least-squares computer code: $^{141,144}Ce$: ^{51}Cr; ^{131}I; $^{103,106}Ru$; ^{134}Cs; ^{137}Cs; ^{95}Zr-Nb; ^{58}Co; ^{54}Mn; ^{65}Zn; ^{59}Fe; ^{60}Co; ^{40}K; and ^{140}Ba-La.

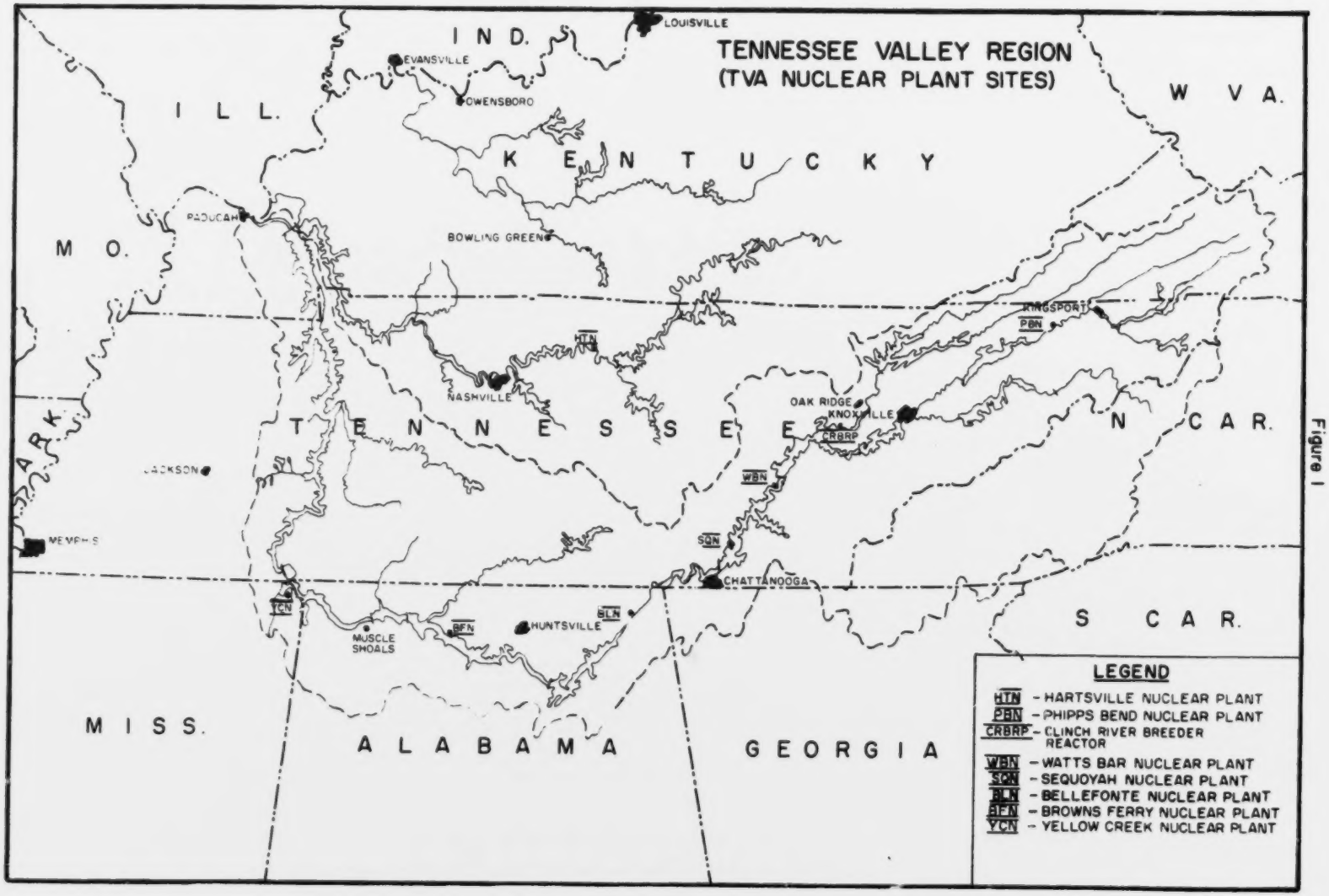

Figure 1

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Table 1

ENVIRONMENTAL RADIOACTIVITY SAMPLING SCHEDULE

Station Location	Air Filter	Charcoal Filter	Rain-water	Heavy Particle Fallout	Atmospheric Moisture	Soil	Vegetation	Milk	River Water	Well Water	Public Water	Aquatic Life and Sediment
Chattanooga	W	W	M	M		A					M	
Dayton	W	W	M	M	BW	A					M	
Sale Creek	W	W	M	M		A						
Daisy	W	W	M	M		A					M	
Red Bank	W	W	M	M		A						
Volunteer Ordinance Works (Harrison)	W	W	M	M		A						
Harrison Bay	W	W	M	M		A						
Georgetown	W	W	M	M		A						
Chester Frost Park (formerly Hamilton County Park)	W	W	M	M		A						
Work	W	W	M	M		A						
Site N	W	W	M	M	BW	A						
Site S	W	W	M	M	BW	A						
Farm L							Q	W				
Farm J							Q	W				
Farm HW							Q	W				
Farm M							Q	W				
Farm Hw							M					
Farm Br							M					
Farm G							M					
Chickamauga Reservoir									M			Q/S
E. I. Dupont											M	
Cleveland, TN											M	
C. F. Industries											M	
On Site Well (1)										M		
Farm Ma										M		
Farm S (Control)							Q/M[a]	W		M		
Farm B (Control)							Q/M[a]	W		Q		
Farm C (Control)							Q/M[a]	W		Q		

W - Weekly BW - Biweekly M - Monthly (every 4 weeks) Q - Quarterly S - Semiannually A - Annually

[a]Quarterly prior to May 1981; monthly thereafter.

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Table 2

ATMOSPHERIC AND TERRESTRIAL MONITORING STATION LOCATIONS

SEQUOYAH NUCLEAR PLANT

Sample Station	Approximate Distance and Direction from Plant
LM-1 SQ, Southwest	0.75 miles (1.2 kilometers) SW
LM-2 SQ, Northeast	0.75 miles (1.2 kilometers) N
PM-2 SQ, Northwoods, TN	10.5 miles (16.9 kilometers) WSW
PM-2 SQ, Chester Frost Park, TN (formally Hamilton County Park)	3.75 miles (6.0 kilometers) SW
PM-3 SQ, Daisy, TN	5.5 miles (8.8 kilometers) W
PM-4 SQ, Sale Creek, TN	10.5 miles (16.9 kilometers) N
PM-5 SQ, Georgetown, TN	9.5 miles (14.5 kilometers) ENE
PM-6 SQ, Work, TN	4.5 miles (7.2 kilometers) NNE
PM-7 SQ, Harrison Bay, TN	3.5 miles (5.6 kilometers) SE
PM-8 SQ, Harrison, TN	8.75 miles (14.1 kilometers) SSW
RM-1 SQ, Chattanooga, TN (Control)	16.75 miles (27.0 kilometers) SW
RM-2 SQ, Dayton, TN (Control)	17.75 miles (28.6 kilometers) NNE
Farm J	1.25 miles (2.0 kilometers) W
Farm HW	1.25 miles (2.0 kilometers) NW
Farm L	2.75 miles (4.4 kilometers) NNE
Farm M	3.5 miles (5.6 kilometers) NNE
Farm Ma	0.75 miles (1.2 kilometers) W
Farm HW	2.5 miles (4.0 kilometers) N
Farm Br	2.25 miles (3.6 kilometers) SSW
Farm G	1.5 miles (2.4 kilometers) NNW
Farm B (Control)	43.0 miles (69.2 kilometers) NE
Farm C (Control)	16.0 miles (25.7 kilometers) NE
Farm S (Control)	12.0 miles (19.3 kilometers) NNE

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Table 3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

A. Specific Analyses

NOMINAL LOWER LIMIT OF DETECTION (LLD)*

	Air Particulates pCi/m^3	Charcoal pCi/m^3	Fallout mCi/km^2	Water pCi/l	Vegetation and grain pCi/g, dry	Soil and Sediment pCi/g, dry	Fish, clam flesh, plankton, pCi/g, dry	Clam shells pCi/g, dry	Foods, meat, poultry, pCi/kg, wet	Milk pCi/l
Total α				0.4	0.01				1.5	
Gross α	0.005			2.0	0.05	0.35	0.1	0.7		
Gross β	0.01		0.05	2.4	0.20	0.70	0.1	0.7	25	
^{3}H				330						
^{131}I		0.02								0.5
^{89}Sr	0.005			10	0.25	1.5	0.5	5.0	40	10
^{90}Sr	0.001			2	0.05	0.3	0.1	1.0	8	2

*All LLD values for isotopic separations are calculated by the method developed by Pasternack and Harley as described in HASL-300. Factors such as sample size, decay time, chemical yield, and counting efficiency may vary for a given sample; these variations may change the LLD value for the given sample. The assumption is made that all samples are analyzed within one week of the collection date. Conversion factors: 1 pCi = 3.7×10^{-2} Bq; 1 mCi = 3.7×10^{7} Bq.

Table 3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

B. Gamma Analyses

NOMINAL LOWER LIMIT OF DETECTION (LLD)

	Air particulates pCi/m³		Water and milk pCi/l		Vegetation and grain pCi/g, dry		Soil and sediment pCi/g, dry		Fish pCi/g, dry		Clam flesh and plankton pCi/g, dry		Clam shells pCi/g, dry		Foods, (tomatoes potatoes, etc.) pCi/kg, wet		Meat and poultry pCi/kg, wet	
	NaI*	Ge(Li)**	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)
^{141,144}Ce	0.03		38		0.55		0.35		0.35				0.35		38		90	
^{144}Ce		0.02		33		0.22		0.06		0.06	0.35			0.06		33		40
^{51}Cr	0.07	0.03	60	44	1.10	0.47	0.60	0.10	0.60	0.10	0.56		0.60	0.10	60	44	200	90
^{131}I	0.01	0.01	15	8	0.35	0.09	0.20	0.02	0.20	0.02	0.07		0.20	0.02	15	8	50	20
^{103,106}Ru	0.04		40		0.65		0.45		0.45				0.45		40		150	
^{106}Ru		0.03		40		0.51		0.11		0.11	0.74			0.11		40		90
^{134}Cs	0.01	0.02	10	26	0.20	0.33	0.12	0.08	0.12	0.08	0.48		0.12	0.08	10	26	40	50
^{137}Cs	0.01	0.01	10	5	0.20	0.06	0.12	0.02	0.12	0.02	0.08		0.12	0.02	10	5	40	15
^{95}Zr-Nb	0.01		10		0.20		0.12		0.12				0.12		10		40	
^{95}Zr		0.01		10		0.11		0.03		0.03	0.15			0.03		10		20
^{95}Nb		0.01		5		0.05		0.01		0.01	0.07			0.01		5		15
^{58}Co	0.02	0.01	15	5	0.23	0.05	0.20	0.01	0.20	0.01	0.07		0.20	0.01	15	5	55	15
^{54}Mn	0.02	0.01	10	5	0.20	0.05	0.15	0.01	0.15	0.01	0.08		0.15	0.01	10	5	40	15
^{65}Zn	0.02	0.01	15	9	0.25	0.11	0.23	0.02	0.23	0.02	0.17		0.23	0.02	15	9	70	20
^{60}Co	0.01	0.01	10	5	0.17	0.06	0.11	0.01	0.11	0.01	0.08		0.11	0.01	10	5	30	15
^{40}K	0.10		150		2.50		0.90		0.90				0.90		150		400	
^{140}Ba-La	0.02		15		0.68		0.15		0.15				0.15		15		50	
^{140}Ba		0.02		25		0.34		0.07		0.07	0.30			0.07		25		50
^{140}La		0.01		7		0.08		0.02		0.02	0.10			0.02		7		15

*The NaI(Tl) LLD values are calculated by the method developed by Pasternack and Harley as described in HASL-300 and Nucl. Instr. Methods 91, 533-40 (1971). These LLD values are expected to vary depending on the activities of the components in the samples. These figures do not represent the LLD values achievable on a given sample. Water is counted in a 3.5-L Marinelli beaker. Vegetation, fish, soil, and sediment are counted in a 1-pint container as dry weight. The average dry weight is 120 grams for vegetation and 400-500 grams for soil sediment and fish. Meat and poultry are counted in a 1-pint container as dry weight, then corrected to wet weight using an average moisture content of 70%. Average dry weight is 250 grams. Air particulates are counted in a well crystal. The counting system consists of a multichannel analyzer and either a 4" x 4" solid or 4" x 5" well NaI(Tl) crystal. The counting time is 4000 seconds. All calculations are performed by the least-squares computer program ALPHA-M. The assumption is made that all samples are analyzed within one week of the collection date.

**The Ge(Li) LLD values are calculated by the method developed by Pasternack and Harley as described in HASL-300. These LLD values are expected to vary depending on the activities of the components in the samples. These figures do not represent the LLD values achievable on given samples. Water is counted in either a 0.5-L or 3.5-L Marinelli beaker. Solid samples such as soil, sediment, and clam shells are counted in a 0.5-L Marinelli beaker as dry weight. The average dry weight is 400-500 grams. Air filters and very small volume samples are counted in petrie dishes centered on the detector endcap. The counting system consists of a ND-4420 multichannel analyzer and either a 25%, 14%, 16%, or 29% Ge(Li) detector. The counting time is normally 8 hours. All spectral analysis is performed using the software provided with the ND-4420. The assumption is made that all samples are analyzed within one week of the collection date.
Conversion factor: 1 pCi = 3.7×10^{-2} Bq.

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Table 4

Results Obtained in Interlaboratory Comparison Program

A. Air Filter (pCi/filter)

Date	Gross Alpha			Gross Beta			Strontium-90			Cesium-137		
	EPA value (±3σ)	TVA WARL[a]	AVG. EARL[b]	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL
12/80	21±9	22	23	19±9	24	26	0	2	<2	19±9	20	22
3/81	30±13	31	31	50±9	55	49	18±2.6	18	15[c]	14±9	15	14
6/81	28±12	29	32	54±9	62	59	19±2.6	19	23[c]	16±9	17	18
9/81	25±11	26	25	51±9	61[c]	54	16±2.6	16	19[c]	19±9	21	20

B. Tritium in Urine (pCi/L)

Date	EPA Value (±3σ)	TVA AVERAGE	
		WARL	EARL
3/81	810±549	713	390
6/81	1600±585	1637	1830[d]
9/81	2050±599	2103	-[e]
11/81	2700±615	2573	2623

a. Western Area Radiological Laboratory, Muscle Shoals, Alabama
b. Eastern Area Radiological Laboratory, Vonore, Tennessee
c. Efficiency curves were checked and known spikes were run. Everything found was within acceptable limits. We are awaiting the next cross-check for further investigation.
d. Results were mailed to EPA but not reported by them.
e. Sample was lost in analysis. There was insufficient time to obtain another sample from EPA and reanalyze.

Table 4 (Contd)

Results Obtained in Interlaboratory Comparison Program

E. Milk (pCi/L)[k]

Date	Strontium - 89			Strontium - 90			Iodine - 131			Cesium - 137			Barium - 140			Potassium			Cobalt - 60		
	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL
1/81	0	<10	<10	20±5.2	21	20	26±17	24	21	43±16	40	41	0	<25	<15	1550±232	1490	1453			
4/81	25±9	[e]	28	11±2.6	[e]	13	26±10	21	29	22±9	21	24	0	<15	<15	1559±135	1513	1674			
7/81	25±9	23	30	17±2.6	14[m]	16	.01±	<15[n]	<15	31±9	32	32	0	<15	<15	1600±139	1623	1620			
10/81	23±9	25	28	18±2.6	17	16	52±10	49[n]	47	25±9	27	27				1530±133	1620	1500			

F. Foods (pCi/kg, Wet Weight)[o]

3/81	47±9	42	44	29±2.8	38[p]	21[p]	119±21	126	121[q]	53±9	56	55[q]	0	<15	<15	2640±229	2857	2917			
7/81	44±9	53	51	31±2.8	31	32	82±14	80	106[q]	45±9	43	54[q]	0	<25	<25	2640±229	2870	3437			
11/81	38±9	49[p]	54[p]	23±2.6	25	22	None			33±9	29	35	0	<15	<25	2730±237	2820[r]	2720	30±9	25	32

k. Values for potassium are reported as mg/liter of sample.
m. Results were marginally out of limits. Efficiency curves were checked with no conclusive findings. Subsequent results have been satisfactory.
n. Only two results were sent to EPA. Results were not included in their analysis.
o. Values for potassium are reported as mg/kg sample.
p. Investigation of this problem was initiated but no satisfactory conclusions have been reached. We suspect difficulties arising from sample inhomogeniety.
q. An incorrect weight was obtained in the gamma analysis of this sample. Further analysis destroyed the sample so that the correct weight could not be determined.
r. Investigation was conducted. No satisfactory explanation was found. Other cross-checks on this isotope in different media are satisfactory.

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Table 4 (Contd)

Results Obtained in Interlaboratory Comparison Program

C. Radiochemical Analyses of Water (pCi/L)

Date	Gross Alpha			Gross Beta			Strontium - 89			Strontium - 90			Tritium			Iodine - 131[f]		
	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL
1/81	9±9	10	9	44±9	49	49	16±9	11	14	34±3.1	38[g]	28[h]						
2/81													1760±591	1917	1753			
3/81	25±10	23	15[i]	25±9	26	29												
4/81													2710±615	2467	2723	30±10	32	28
5/81	21±9	21	14	14±9	14	16	36±9	40	33	22±2.6	21	22						
6/81													1950±596	1990	1947			
7/81	22±10	20	22	15±9	15	18												
8/81													2630±613	2623	2713	73±13	79	73
9/81	33±14	29	18[i]	28±9	29	26	23±9	26	23	11±2.6	11	10						
10/81													2210±603	2263	2197			
11/81	21±9	21	13	23±9	18	24												
12/81													2700±615	2717	2807	76±13	65	56[j]

D. Gamma-Spectral Analysis of Water (pCi/L)

Date	Chromium - 51			Cobalt - 60			Zinc - 65			Ruthenium - 106			Cesium - 134			Cesium - 137		
	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL	EPA value (±3σ)	TVA WARL	AVG. EARL
2/81	0	<60	<60	25±9	25	25	85±9	84	83	0	<40	<40	36±9	39	35	4±9	6	10
6/81	0	<60	<60	17±9	18	17	0	<15	<15	15±9	<40	<40	21±9	23	21	31±9	27	30
10/81	34±9	<60	<60	22±9	25	22	24±9	26	21	0	<40	<40	21±9	21	24	32±9	35	32

f. Specific analysis for ^{131}I to test the procedures used for the analysis of milk.
g. Investigations of the analytical procedure were conducted and new efficiency curves were determined. Results have been satisfactory since that time.
h. New efficiency curves were determined subsequent to this analysis. Subsequent results were satisfactory.
i. Excess humidity in counting room and a change in the amount of solid introduced into the sample by EPA are suspected in the difficulty with this sample type. Steps have been taken to correct or compensate for these items.
j. Results are possibly due to an incorrect chemical form of the precipitate counted in this procedure. Investigations continue.

Atmospheric Monitoring

The atmospheric monitoring network is divided into three subgroups. Two local air monitors are located within the plant boundary. Eight perimeter air monitors are located at distances out to 10.5 miles (16.9 kilometers) from the plant in the towns of Sale Creek, Daisy, Red Bank (Northwoods), Harrison, and four other populated areas. The remote air monitors used as control or baseline stations are located at distances out to 17.75 miles (28.6 kilometers) from the plant in the town of Dayton and the city of Chattanooga. See figures 2, 3, 4, and 5.

At each monitor, air is continuously pulled through a Hollingsworth and Voss LB 5211 glass fiber filter at a regulated flow of 3 ft^3/min (0.085 m^3/min). In series with, but downstream of the particulate filter, is a charcoal filter used to collect iodine. Each monitor has a collection tray and storage container to collect rainwater on a continuous basis, and a horizontal platform covered with gummed acetate to catch and hold heavy particle fallout. Moisture is collected from the atmosphere at each local monitor and at one remote monitor and analyzed for tritium.

Each of the local and perimeter air monitors is fitted with a GM tube that continuously scans the particulate filter. The disintegration rate of the atmospheric radioactivity is continuously recorded at each station. The data from the two local monitors and the four perimeter monitors located within five miles of the plant are radiotelemetered into the plant control room.

Air filters are collected weekly and analyzed for gross beta activity. During this reporting period five samples were not obtained because of equipment malfunction. Two samples were lost during the strontium analysis. No analyses are performed until three days after sample collection. The samples are composited monthly for analysis of specific gamma-emitting radionuclides and quarterly for ^{89}Sr and ^{90}Sr analysis. The results are presented in table 6.

The annual averages of the gross beta activity in the air particulate filters at the indicator stations (local and perimeter monitors) and at the control stations (remote monitors) for the years 1971-1981 are presented in figure 6. Increased levels due to fallout from atmospheric nuclear weapons testing are evident, especially in 1971, 1977, 1978, and 1981. These fluctuations are consistent with data from monitoring programs conducted by TVA at nonoperating nuclear power plant construction sites.

Table 5 presents the maximum permissible concentrations (MPC) recommended by 10 CFR 20 for nonoccupational exposure.

Rainwater is collected and analyzed for gross beta activity, specific gamma-emitting isotopes, and strontium. During this period one sample contained insufficient volume for any analyses, and one sample contained insufficient volume for strontium analyses. For the gross beta analysis, a maximum of 500 ml of the sample is boiled to dryness and counted. A gamma scan is performed on a 3.5-liter monthly sample. The strontium isotopes are separated chemically and counted in a low background system. The results are shown in table 7.

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The gummed acetate that is used to collect heavy particle fallout is changed monthly. The samples are ashed and counted for gross beta activity. The results are given in table 8. During this reporting period one sample was lost during analysis.

Charcoal filters are collected and analyzed for radioiodine. During this period five samples were not obtained because of equipment malfunction. The filter is counted in a single channel analyzer system. The data are shown in table 9.

An atmospheric moisture collection device containing molecular sieve is located at each local monitor and at one remote monitor. Samples are taken every other week, the moisture driven off the molecular sieve, collected in a cold trap, distilled, and counted for tritium content. The results are shown in table 10. During this reporting period 20 samples were not obtained because of equipment malfunction and 5 samples were lost during analysis.

In late September the levels of tritium measured in the atmosphere increased from 6-10 pCi/m^3 up to 100-400 pCi/m^3. Since the increases were observed at the offsite control station and at two stations around the Watts Bar Nuclear Plant construction site (nonoperational plant) as well as at the SQN onsite stations, it was concluded that the increased levels were not attributable to SQN. Efforts were made to determine the cause of the increases but were unsuccessful. The levels remained somewhat elevated but decreased to around 20 pCi/m^3 by the end of the year. The highest concentration measured is only 0.2 percent of the MPC for tritium in air as shown in table 5.

Table 5

MAXIMUM PERMISSIBLE CONCENTRATIONS

FOR NONOCCUPATIONAL EXPOSURE

	MPC	
	In Water pCi/l*	In Air pCi/m³*
Alpha	30	
Nonvolatile beta	3,000	100
Tritium	3,000,000	200,000
^{137}Cs	20,000	500
$^{103,106}Ru$	10,000	200
^{144}Ce	10,000	200
^{95}Zr-^{95}Nb	60,000	1,000
^{140}Ba-^{140}La	20,000	1,000
^{131}I	300	100
^{65}Zn	100,000	2,000
^{54}Mn	100,000	1,000
^{60}Co	30,000	300
^{89}Sr	3,000	300
^{90}Sr	300	30
^{51}Cr	2,000,000	80,000
^{134}Cs	9,000	400
^{58}Co	90,000	2,000

*1 pCi = 3.7×10^{-2} Bq.

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TABLE 6

RADIOACTIVITY IN AIR FILTER

PCI/M(3) - 0.037 BQ/M(3)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	0.010	0.03(514/ 517)	NORTHWOODS, TN	0.10(52/ 52)	0.09(101/ 102)	
619		0.01- 0.40	10.5 MILES WSW	0.02- 0.33	0.01- 0.36	
GAMMA (GELI) 156						
CE-141	0.010	0.01(16/ 130)	NORTHWOODS, TN	0.01(2/ 13)	0.01(4/ 26)	
		0.01- 0.02	10.5 MILES WSW	0.01- 0.02	0.01- 0.01	
CE-144	0.020	0.03(27/ 130)	NORTHWOODS, TN	0.04(2/ 13)	0.03(5/ 26)	
		0.02- 0.04	10.5 MILES WSW	0.03- 0.04	0.02- 0.04	
RU-103	NOT ESTAB	0.01(57/ 130)	LM1 SOUTHWEST	0.02(5/ 13)	0.01(12/ 26)	
		0.00- 0.03	0.75 MILES SW	0.01- 0.02	0.00- 0.02	
ZR-95	0.010	0.03(55/ 130)	LM1 SOUTHWEST	0.03(5/ 13)	0.02(14/ 26)	
		0.01- 0.06	0.75 MILES SW	0.02- 0.06	0.01- 0.05	
NB-95	0.010	0.04(67/ 130)	LM1 SOUTHWEST	0.05(7/ 13)	0.04(14/ 26)	
		0.01- 0.11	0.75 MILES SW	0.01- 0.09	0.01- 0.09	
K-40	NOT ESTAB	0.02(81/ 130)	GEORGETOWN, TN	0.03(9/ 13)	0.03(13/ 26)	
		0.00- 0.07	9.0 MILES ENE	0.00- 0.07	0.00- 0.06	
BI-214	0.020	0.03(19/ 130)	COUNTY PARK, TN	0.04(1/ 13)	0.03(7/ 26)	
		0.02- 0.05	3.75 MILES SW	0.04- 0.04	0.02- 0.05	
PB-214	0.020	0.03(14/ 130)	COUNTY PARK, TN	0.04(1/ 13)	0.03(5/ 26)	
		0.02- 0.04	3.75 MILES SW	0.04- 0.04	0.02- 0.06	
PB-212	NOT ESTAB	0.00(40/ 130)	LM1 SOUTHWEST	0.00(5/ 13)	0.00(11/ 26)	
		0.00- 0.00	0.75 MILES SW	0.00- 0.00	0.00- 0.01	
RA-226	NOT ESTAB	0.01(1/ 130)	GEORGETOWN, TN	0.01(1/ 13)	26 VALUES <LLD	
		0.01- 0.01	9.0 MILES ENE	0.01- 0.01		
BE-7	0.150	0.06(81/ 130)	COUNTY PARK, TN	0.07(6/ 13)	0.07(14/ 26)	
		0.05- 0.13	3.75 MILES SW	0.06- 0.10	0.05- 0.10	
TL-208	NOT ESTAB	0.00(46/ 130)	WORK, TN	0.00(3/ 13)	0.00(9/ 26)	
		0.00- 0.00	4.5 MILES NNE	0.00- 0.00	0.00- 0.00	
AC-228	NOT ESTAB	0.01(5/ 130)	NORTHWOODS, TN	0.01(2/ 13)	0.01(4/ 26)	
		0.00- 0.02	10.5 MILES WSW	0.01- 0.02	0.00- 0.01	
PA-234M	NOT ESTAB	0.49(1/ 130)	DAISY, TN	0.49(1/ 13)	0.73(1/ 26)	
		0.49- 0.49	5.5 MILES W	0.49- 0.49	0.73- 0.73	
SR-89	0.005	0.01(19/ 36)	LM1 SOUTHWEST	0.01(2/ 4)	0.01(4/ 8)	
46		0.01- 0.01	0.75 MILES SW	0.01- 0.01	0.01- 0.01	
SR-90	0.001	0.00(8/ 38)	NORTHWOODS, TN	0.00(1/ 4)	0.00(2/ 8)	
46		0.00- 0.00	10.5 MILES WSW	0.00- 0.00	0.00- 0.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 7

RADIOACTIVITY IN RAINWATER

PCI/L - 0.037 BQ/L

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	2.400	13.45 (127/ 130)	GEORGETOWN, TN	15.79 (10/ 13)	16.39 (21/ 25)	
155		2.68- 35.12	9.0 MILES ENE	3.55- 26.80	3.23- 42.28	
GAMMA (GSLI)						
104						
BE-59	NOT ESTAB	5.15 (35/ 96)	COUNTY PARK, TN	8.00 (1/ 8)	4.00 (10/ 16)	
		0.60- 9.60	3.75 MILES SW	8.00- 8.00	0.60- 7.20	
CS-7	NOT ESTAB	54.94 (72/ 96)	HARRISON BAY, TN	73.82 (6/ 8)	54.90 (15/ 18)	
		12.10- 99.10	3.5 MILES SE	51.10- 90.00	1.50- 83.30	
GAMMA (GELI)						
51						
ZR-95	10.000	11.15 (3/ 44)	COUNTY PARK, TN	12.08 (1/ 5)	14.19 (1/ 7)	
		10.20- 12.08	3.75 MILES SW	12.08- 12.08	14.19- 14.19	
NB-95	5.000	8.35 (8/ 44)	GEORGETOWN, TN	12.82 (1/ 4)	7.45 (2/ 7)	
		5.80- 12.82	9.0 MILES ENE	12.82- 12.82	6.51- 8.39	
K-40	NOT ESTAB	32.91 (15/ 44)	NORTHWOODS, TN	65.42 (1/ 4)	70.48 (1/ 7)	
		3.71- 80.00	10.5 MILES WSW	65.42- 65.42	70.48- 70.48	
BI-214	NOT ESTAB	5.28 (18/ 44)	HARRISON BAY, TN	9.53 (2/ 4)	10.16 (4/ 7)	
		0.85- 19.02	3.5 MILES SE	0.05- 19.02	0.49- 32.33	
PB-214	NOT ESTAB	10.09 (9/ 44)	HARRISON BAY, TN	34.18 (1/ 4)	12.64 (2/ 7)	
		1.56- 34.18	3.5 MILES SE	34.18- 34.18	8.31- 17.37	
PB-212	NOT ESTAB	2.12 (13/ 44)	LM1 SOUTHWEST	4.69 (2/ 5)	0.05 (2/ 7)	
		0.30- 4.13	3.75 MILES SW	1.20- 1.19	0.03- 0.07	
RE-7	NOT ESTAB	45.53 (14/ 44)	SALE CREEK, TN	58.37 (2/ 6)	38.68 (3/ 7)	
		25.73- 76.68	10.5 MILES N	40.06- 76.68	26.48- 43.85	
SR-89	10.000	15.42 (27/ 129)	WORK, TN	15.94 (2/ 13)	13.29 (5/ 25)	
104		10.77- 18.84	4.5 MILES NNE	15.75- 16.13	11.15- 14.65	
SR-90	2.000	2.75 (3/ 129)	HARRISON, TN	3.33 (1/ 13)	25 VALUES <LLD	
104		2.15- 3.33	8.75 MILES SSW	3.33- 3.33		
TRITIUM	330.000	391.81 (1/ 130)	SALE CREEK, TN	391.81 (1/ 13)	366.80 (2/ 25)	
155		391.81- 391.81	10.5 MILES N	391.81- 391.81	358.46- 375.14	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 8

RADIOACTIVITY IN HEAVY PARTICLE FALLOUT

PCI/KM(2) - 37[illegible].06 BQ/KM(2)

NAME OF FACILITY SEQUOYAH DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b]	RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	0.05	3.36 (12/ 12)	GEORGETOWN, TN	3.97	(13/ 13)	0.85 (26/ 26)	
156		0.97- 8.10	8.0 MILES ENE	0.11-	2.74	0.89- 3.10	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 9

RADIOACTIVITY IN CHARCOAL FILTERS

PCI/M(3) - 0.037 BQ/M(3)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]		LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b]	RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
IODINE IN AIR	0.02	0.03	31/ 517)	SALE CREEK, TN	0.03	1/ 52)	0.02	2/ 102)	
61		0.02-	0.04	10.5 MILES N	0.03-	0.03	0.02-	0.02	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 10

RADIOACTIVITY IN ATMOSPHERIC MOISTURE

PCI/M(3) = [illegible] BQ/M(3)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
TRITIUM 67	NOT ESTAB	[illegible] 42/ 42) [illegible]- 123.07	LM2 NORTHEAST 0.75 MILES N	21.09(23/ 23) 0.99- 85.39	41.21(20/ 20) 0.16- 409.43	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Figure 2

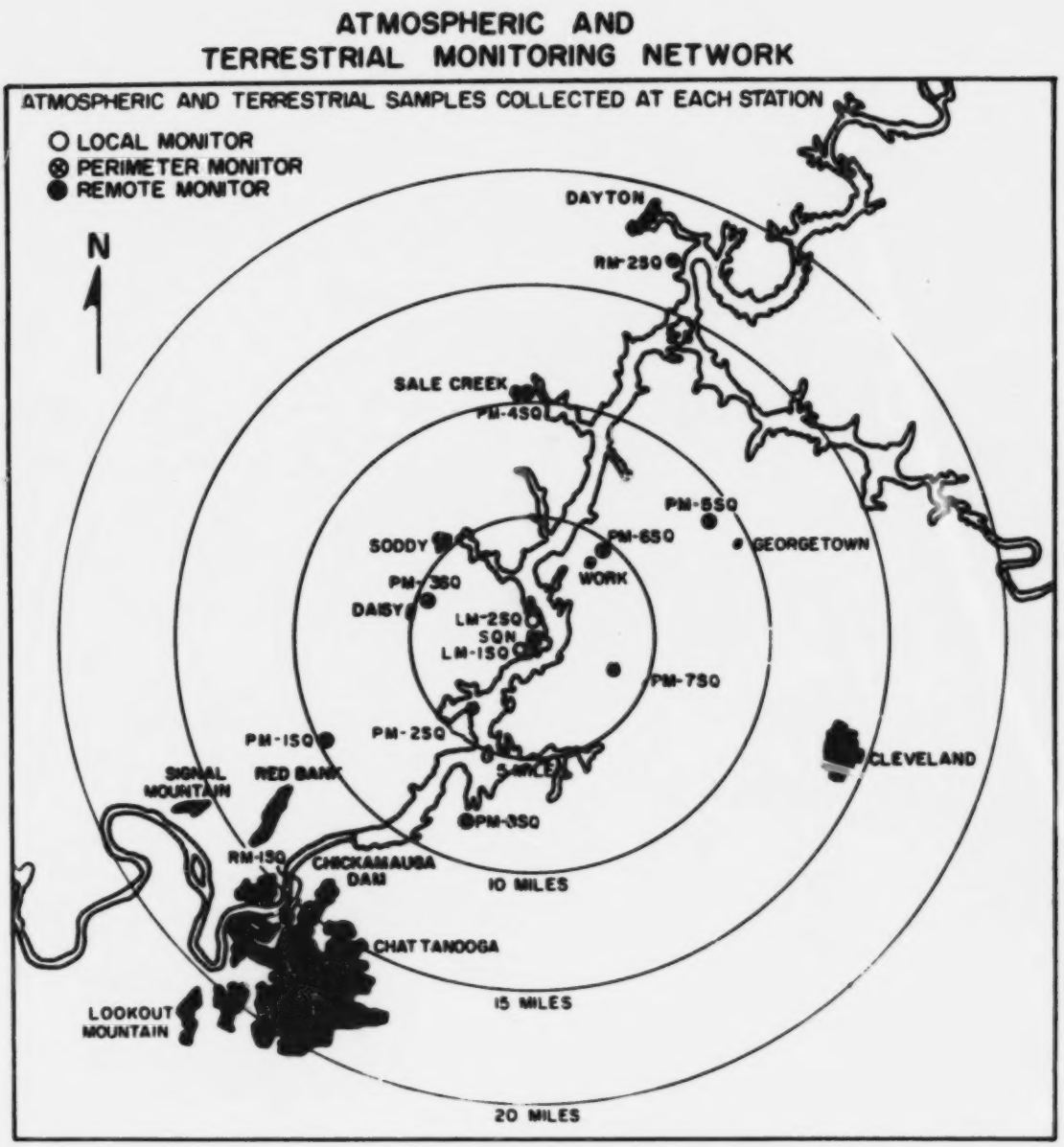

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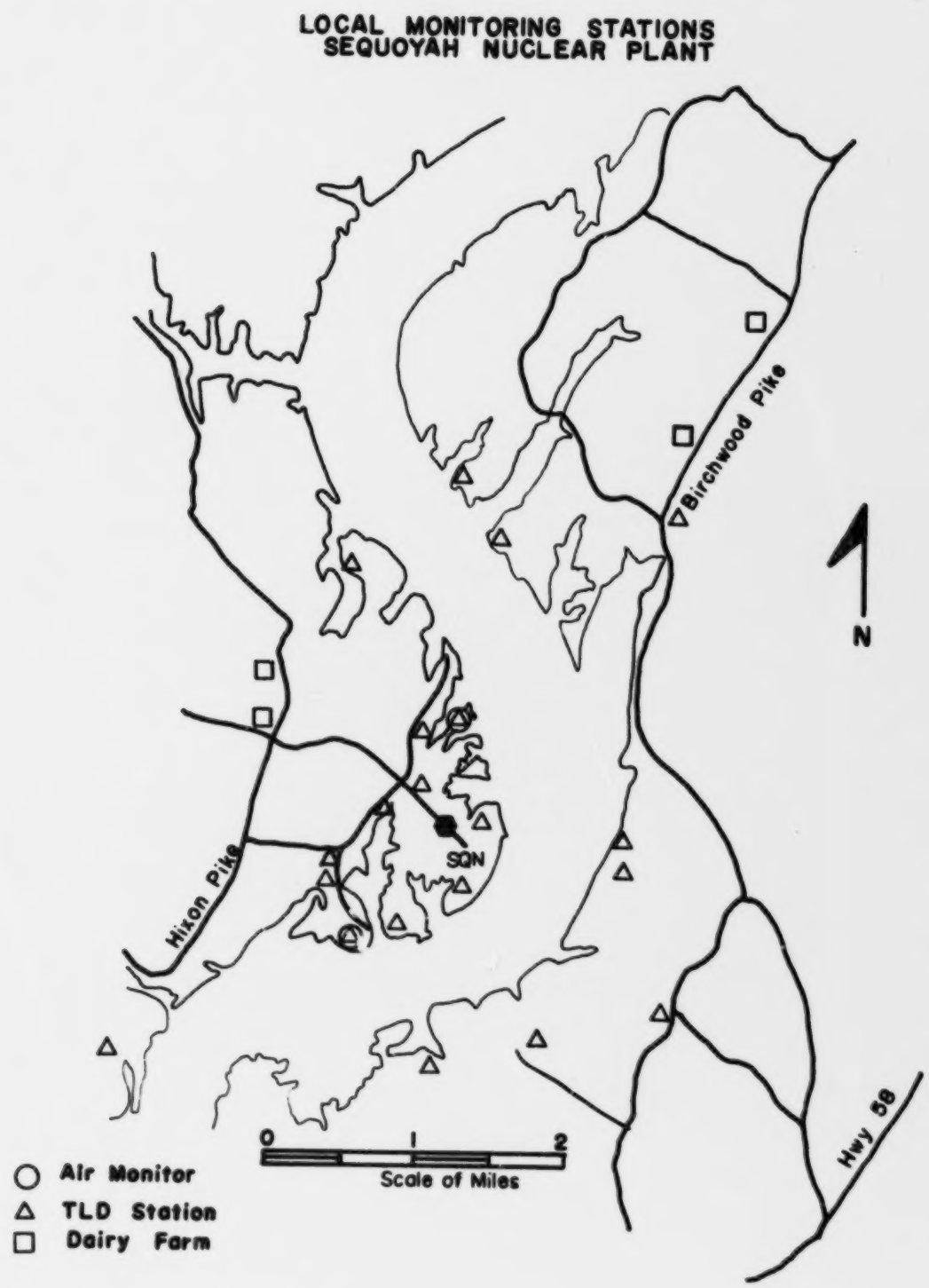
Figure 3



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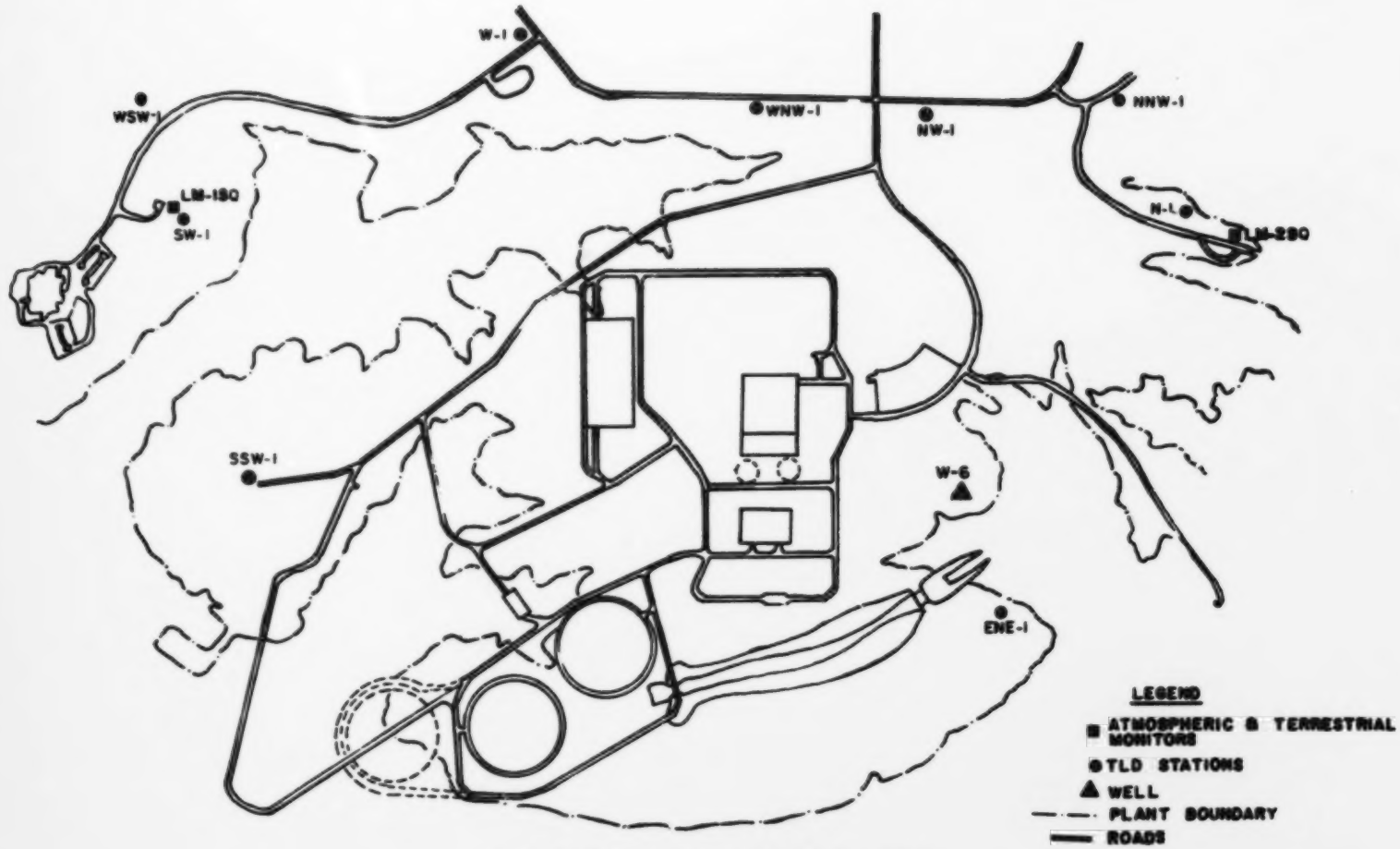

SEQUOYAH NUCLEAR PLANT

SITE MONITORING STATIONS

Figure 4

Figure 5

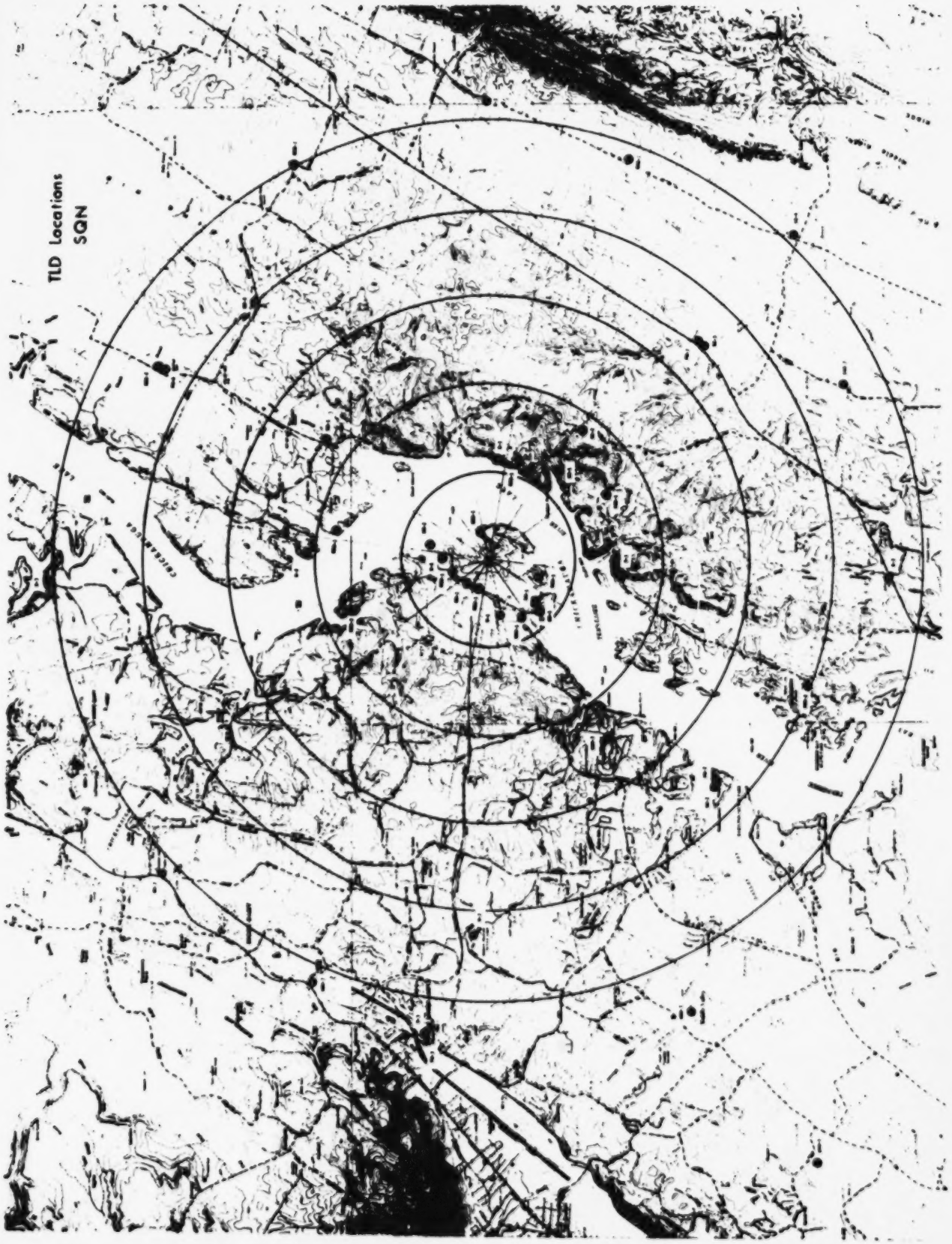

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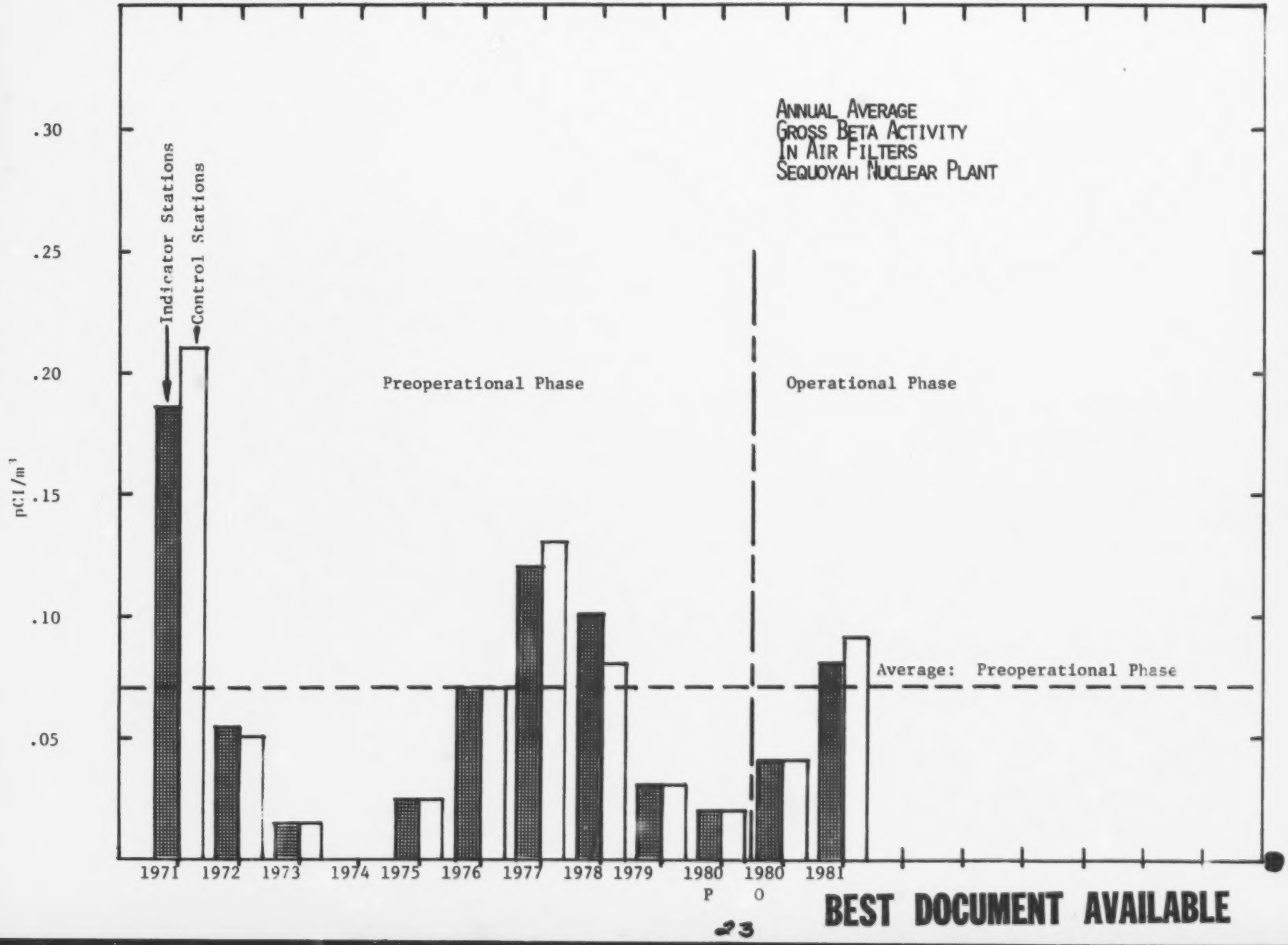
Figure 6



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Terrestrial Monitoring

Milk

Milk is collected weekly from two dairy farms and two other farms within a 5-mile radius of the plant (see figure 3), and from at least one of three control dairy farms. Raw milk is analyzed weekly for ^{131}I, and monthly for gamma-emitting isotopes, and for strontium. The results are shown in table 11. Samples were unavailable from one location for a period of four weeks when the cow went dry. Strontium analyses were not conducted on two samples when one of them spoiled and the other contained an insufficient volume of milk.

As has been noted in the other monitoring reports, the levels of ^{90}Sr in milk samples from farms producing milk for private consumption only are up to six times the levels found in milk from commercial dairy farms. Samples of feed and water supplied to the animals were analyzed in 1979 in an effort to determine the source of the strontium. Analysis of dried hay samples indicated levels of ^{90}Sr slightly higher than those encountered in routine vegetation samples. Analysis of pond water indicated no significant strontium activity.

This phenomenon was observed during preoperation monitoring near Sequoyah and Bellefonte Nuclear Plants at farms where only one or two cows were being milked for private consumption of the milk. It is postulated that the feeding practices of these small farmers differ from those of the larger dairy farmers to the extent that fallout from atmospheric nuclear weapons testing may be more concentrated in these instances. Similarly, Hansen, et al., reported an inverse relationship between the levels of ^{90}Sr in milk and the quality of fertilization and land management.[a]

In April 1981 milk producing animals were identified at three locations from which milk samples were not being obtained and where the calculated doses to consumers were higher than those at some of the locations being sampled. The owners of the three farms were contacted and asked to participate in the milk monitoring program. One individual had discontinued milking and the other two did not get enough milk to provide a sample. Consequently, monthly vegetation sampling was initiated at these three locations on June 8, 1981.

Land Use Survey

The routine land use survey was conducted in the summer of 1981. It was determined that there are no milk animals nearer the plant than those in areas from which either milk or vegetation is being sampled. Milking had been discontinued at two of the farms. It was concluded from evaluations of the survey results that the small changes in land use have not increased the projected doses to individuals in the area and that appropriate sampling is being conducted.

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[a]Hansen, W.G., et al., Farming Practices and Concentrations of Emission Products in Milk, U.S. Department of Health, Education, and Welfare; Public Health Service Publication No. 999-R-6, May 1964.

Vegetation

Vegetation samples are collected quarterly from the farms from which milk is collected and analyzed for gamma-emitting radionuclides. As described previously, monthly vegetation sampling was initiated at three additional locations in June 1981. To facilitiate evaluation of the data, sampling frequency at the three control farms was increased to monthly at the same time. Approximately 1-2 kg of grass was broken or cut at ground level and returned for analysis. Efforts were made to sample vegetation that was representative of the pasturage where cattle graze. Table 12 gives the results obtained from the laboratory analyses.

In addition to the gamma spectral analysis, gross alpha and gross beta analyses were conducted on 10 samples and 25 samples were analyzed for ^{89}Sr and ^{90}Sr content. These results are also presented in table 12.

Soil

Soil samples were collected annually near each monitoring station to provide an indication of any long-term buildup of radioactivity in the environment. Two additional samples were taken at one of the control stations in conjunction with the Watts Bar Nuclear Plant monitoring program. An auger or "cookie cutter" type sampler was used to obtain samples of the top two inches (5 cm) of soil. These samples were analyzed for gross beta activity, gamma-emitting radionuclides, ^{89}Sr, and ^{90}Sr. The results are given in table 13.

Ground Water

An automatic sequential-type sampling device has been installed on a well downgradient from Sequoyah Nuclear Plant. A composite sample from this well is analyzed for gross beta activity and gamma-emitting radionuclides monthly and composited quarterly for determination of tritium. A grab sample is also taken from a farm near the plant and a control well across the river from the plant. The results of the analysis of well water are shown in table 14.

Public Water

Potable water supplies taken from the Tennessee River in the vicinity of Sequoyah Nuclear Plant are sampled and analyzed monthly for gross beta and gamma-emitting radionuclides. Tritium, ^{89}Sr, and ^{90}Sr concentrations are determined in quarterly composite samples. The first potable water supply downstream from the plant is equipped with an automatic sampler with composite samples analyzed monthly. Five additional water supplies are sampled monthly by the collection of grab samples. An automatic sampler was installed on the upstream water supply in May 1981. Grab sampling was discontinued and automatic sampling begun the first week of June 1981. The results are shown in table 15.

Figure 7 shows the trends in gross beta activity in drinking water from 1971 through 1981. The annual averages reported in 1981 are consistent

with the patterns established in the preoperational phase of the monitoring program and are slightly lower than levels reported in surface water samples (figure 11).

Environmental Gamma Radiation Levels

Bulb-type Victoreen manganese-activated calcium fluoride (CA_2F: Mn) thermoluminescent dosimeters (TLDs) are placed at 16 stations around the plant near the site boundary, at the perimeter and remote air monitors, and at 22 additional stations approximately 5 miles from the site to determine the gamma exposure rates at these locations. The dosimeters, in energy compensating shields to correct energy dependence, are placed at approximately one meter above the ground, with three TLDs at each station. They are annealed and read with a Victoreen model 2810 TLD reader. The values are corrected for gamma response, self-irradiation, and fading, with individual gamma response calibrations and self-irradiation factors determined for each TLD. The TLDs are exchanged every three months. The quarterly gamma radiation levels determined from these TLDs are given in table 16, which indicates that average levels at onsite stations are approximately 2-3 mR/quarter higher than levels at offsite stations. This is consistent with levels reported at TVA's nonoperating nuclear power plant construction sites where the average radiation levels onsite are generally 2-6 mR/quarter higher than levels offsite. The causes of these differences have not been completely isolated; however, it is postulated that the differences are probably attributable to combinations of influences, such as natural variations in environmental radiation levels, earth moving activities onsite, the mass of concrete employed in the construction of the plant, and other undetermined influences.

Figure 8 compares plots of the data from the onsite or site boundary stations with those from the offsite stations over the period from 1976 through 1981. To reduce the variations present in the data sets, a four-quarter moving average was constructed for each set. Figure 9 presents a trend plot of the direct radiation levels as defined by the moving averages. The data follow the same general trend as the raw data, but the curves are smoothed considerably.

Prior to 1976 measurements were made with less sensitive dosimeters, and consequently the levels reported in this phase of the preoperational monitoring program are 1-2 times the levels reported herein. Those data are not included in this report.

Poultry and Food Crops

Food crops and poultry raised in the vicinity of SQN are sampled annually as they become available during the growing season. During this sampling period, samples of apples, cabbage, corn, green beans, potatoes, tomatoes, turnip greens, and poultry were collected and analyzed for gross beta and specific gamma-emitting radionuclides. The results are given in tables 17 and 18.

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TABLE 11

RADIOACTIVITY IN MILK

PCI/L - 0.037 BQ/L

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS[b] MEAN (F) RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA (NAI) 55						
K-40	150.000	1208.44 (46/ 46)	LOVELL FARM	1287.98 (13/ 13)	1283.73 (37/ 37)	
		916.20- 1380.18	2.75 MILES NNE	1153.30- 1365.50	1107.10- 1420.80	
IODINE IN MILK 36	0.500	264 VALUES <LLD ANALYSIS PERFORMED			156 VALUES <LLD	
GAMMA (GELI) 7						
CS-137	5.000	9.35 (5/ 5)	JONES FARM	11.23 (2/ 2)	2 VALUES <LLD	
		6.96- 12.93	1.25 MILES W	9.53- 12.93		
K-40	NOT ESTAB	1240.66 (5/ 5)	JONES FARM	1299.81 (2/ 2)	1315.59 (2/ 2)	
		1156.08- 1359.96	1.25 MILES W	1239.66- 1359.96	1290.04- 1341.13	
BI-214	NOT ESTAB	26.07 (1/ 5)		26.07 (1/ 3)	2 VALUES <LLD	
		26.07- 26.07		26.07- 26.07		
PB-212	NOT ESTAB	1.59 (2/ 5)	JONES FARM	2.99 (1/ 2)	0.71 (2/ 2)	
		0.19- 2.99	1.25 MILES W	2.99- 2.99	0.56- 0.86	
TL-208	NOT ESTAB	0.95 (2/ 5)	JONES FARM	1.75 (1/ 2)	0.00 (1/ 2)	
		0.15- 1.75	1.25 MILES W	1.75- 1.75	0.00- 0.00	
SR-89	10.000	14.22 (4/ 49)		16.13 (2/ 11)	39 VALUES <LLD	
51		11.36- 19.71		12.55- 19.71		
SR-90	2.000	10.34 (48/ 49)		17.56 (11/ 11)	2.98 (29/ 30)	
48		2.50- 41.08		10.12- 41.08	2.03- 4.15	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 12

RADIOACTIVITY IN VEGETATION

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)[a]	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]		LOCATION WITH HIGHEST ANNUAL MEAN NAME, DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]		CONTROL LOCATIONS MEAN (F)[b] RANGE[b]		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.050	6.37(	6/ 6)	MALONE FARM	6.98(	2/ 2)	7.67(	4/ 4)	
1		4.14-	7.44	3.5 MILES NNE	6.98-	6.99	3.67-	9.36	
GROSS BETA	0.200	38.36(	6/ 6)	MALONE FARM	49.25(	2/ 2)	42.66(	4/ 4)	
1		25.91-	58.94	3.5 MILES NNE	39.57-	58.94	24.81-	64.44	
GAMMA (GELI)									
71									
CE-141	0.200	0.66(	10/ 43)	MALONE FARM	1.32(	1/ 4)	0.53(	7/ 28)	
		0.21-	1.58	3.5 MILES NNE	1.32-	1.32	0.21-	1.39	
CE-144	0.220	1.38(	35/ 43)	MALONE FARM	1.76(	3/ 4)	1.06(	20/ 28)	
		0.37-	3.05	3.5 MILES NNE	1.23-	2.36	0.32-	2.76	
PR-144	NOT ESTAB	3.26(	2/ 43)		3.83(	1/ 4)	4.14(	1/ 28)	
		2.70-	3.83		3.83-	3.83	4.14-	4.14	
RU-103	0.200	0.53(	10/ 43)	MALONE FARM	0.61(	2/ 4)	0.51(	5/ 28)	
		0.22-	1.00	3.5 MILES NNE	0.22-	1.00	0.20-	1.22	
RU-106	0.510	0.57(	5/ 43)	MALONE FARM	0.65(	1/ 4)	0.53(	1/ 28)	
		0.53-	0.65	3.5 MILES NNE	0.65-	0.65	0.53-	0.53	
CS-137	0.060	0.14(	31/ 43)		0.17(	3/ 9)	0.11(	12/ 26)	
		0.07-	0.31		0.09-	0.31	0.06-	0.28	
ZR-95	0.110	0.60(	27/ 43)	LOVELL FARM	1.47(	2/ 4)	0.75(	14/ 28)	
		0.13-	2.62	2.75 MILES NNE	0.67-	2.27	0.12-	2.74	
NB-95	0.050	1.17(	37/ 43)	MALONE FARM	2.19(	3/ 4)	0.92(	22/ 28)	
		0.05-	4.20	3.5 MILES NNE	0.68-	4.20	0.06-	0.76	
K-40	NOT ESTAB	16.22(	43/ 43)		21.53(	9/ 9)	18.58(	28/ 28)	
		1.83-	33.29		5.85-	33.29	2.90-	43.53	
MN-54	0.050	0.07(	11/ 43)		0.09(	2/ 4)	0.06(	2/ 28)	
		0.05-	0.11		0.07-	0.11	0.05-	0.07	
BI-214	0.100	0.21(	16/ 43)	LOVELL FARM	0.26(	3/ 4)	0.22(	11/ 28)	
		0.10-	0.44	2.75 MILES NNE	0.10-	0.36	0.10-	0.53	
PB-214	NOT ESTAB	0.13(	25/ 43)		0.12(	6/ 9)	0.11(	16/ 26)	
		0.02-	0.21		0.03-	0.19	0.02-	0.37	
PB-212	NOT ESTAB	0.04(	29/ 43)	JONES FARM	0.07(	3/ 4)	0.05(	19/ 28)	
		0.00-	0.14	1.25 MILES W	0.01-	0.13	0.00-	0.32	
RA-226	NOT ESTAB	0.26(	5/ 43)		0.41(	2/ 9)	0.08(	6/ 28)	
		0.04-	0.78		0.04-	0.78	0.04-	0.12	
PB-?	NOT ESTAB	5.32(	43/ 43)		7.63(	4/ 4)	4.20(	26/ 28)	
		1.05-	12.31		3.20-	12.31	1.21-	9.13	
TL-208	NOT ESTAB	0.02(	19/ 43)	MALONE FARM	0.05(	2/ 4)	0.02(	18/ 29)	
		0.00-	0.07	3.5 MILES NNE	0.03-	0.07	0.00-	0.12	
AC-228	NOT ESTAB	0.14(	18/ 43)	JONES FARM	0.28(	2/ 4)	0.12(	12/ 28)	
		0.04-	0.35	1.25 MILES W	0.21-	0.35	0.03-	0.35	
PA-234M	NOT ESTAB	6.41(	1/ 43)		6.41(	1/ 4)	28 VALUES <LLD		
		6.41-	6.41		6.41-	6.41			
SR-89	0.250	1.24(	6/ 15)	LOVELL FARM	1.34(	2/ 3)	0.97(	5/ 10)	
25		0.39-	2.14	2.75 MILES NNE	0.53-	2.14	0.39-	2.03	
SR-90	0.050	0.21(	15/ 15)		0.31(	3/ 3)	0.15(	10/ 10)	
25		0.08-	0.51		0.20-	0.51	0.06-	0.25	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 13

RADIOACTIVITY IN SOIL

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS[a] MEAN (F) RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	0.700	23.52(10/ 10)	GEORGETOWN, TN	34.72(1/ 1)	12.09(4/ 4)	
14		11.21- 34.72	9.0 MILES ENE	34.72- 34.72	9.01- 19.75	
GAMMA (GELI)						
14						
CE-144	0.160	0.11(3/ 10)	LM1 SOUTHWEST	0.19(1/ 1)	4 VALUES <LLD	
		0.07- 0.19	0.75 MILES SW	0.19- 0.19		
RU-103	NOT ESTAB	0.03(3/ 10)	LM1 SOUTHWEST	0.04(1/ 1)	4 VALUES <LLD	
		0.02- 0.04	0.75 MILES SW	0.04- 0.04		
CS-137	0.020	0.55(9/ 10)	HARRISON, TN	1.19(1/ 1)	0.49(4/ 4)	
		0.02- 1.19	8.75 MILES SSW	1.19- 1.19	0.27- 0.97	
ZR-95	0.030	0.11(5/ 10)	LM1 SOUTHWEST	0.14(1/ 1)	0.04(3/ 4)	
		0.04- 0.14	0.75 MILES SW	0.14- 0.14	0.03- 0.04	
NB-95	0.010	0.10(8/ 10)	LM1 SOUTHWEST	0.26(1/ 1)	0.06(3/ 4)	
		0.04- 0.26	0.75 MILES SW	0.26- 0.26	0.05- 0.08	
K-40	0.250	6.87(10/ 10)	GEORGETOWN, TN	18.77(1/ 1)	3.65(4/ 4)	
		2.09- 18.77	9.0 MILES ENE	18.77- 18.77	2.36- 7.23	
MN-54	0.010	0.02(6/ 10)	LM2 NORTHEAST	0.02(1/ 1)	4 VALUES <LLD	
		0.01- 0.02	0.75 MILES N	0.02- 0.02		
BI-214	0.050	0.82(10/ 10)	LM2 NORTHEAST	1.00(1/ 1)	0.71(4/ 4)	
		0.62- 1.00	0.75 MILES N	1.00- 1.00	0.66- 0.83	
BI-212	0.100	1.22(10/ 10)	GEORGETOWN, TN	1.74(1/ 1)	0.80(4/ 4)	
		0.83- 1.74	9.0 MILES ENE	1.74- 1.74	0.57- 1.34	
PB-214	0.050	0.91(10/ 10)	LM2 NORTHEAST	1.08(1/ 1)	0.79(4/ 4)	
		0.70- 1.08	0.75 MILES N	1.08- 1.08	0.71- 0.94	
PB-212	NOT ESTAB	1.05(10/ 10)	GEORGETOWN, TN	1.38(1/ 1)	0.72(4/ 4)	
		0.73- 1.38	9.0 MILES ENE	1.38- 1.38	0.54- 1.15	
RA-226	0.150	0.82(10/ 10)	LM2 NORTHEAST	1.00(1/ 1)	0.71(4/ 4)	
		0.62- 1.00	0.75 MILES N	1.00- 1.00	0.66- 0.83	
RA-224	NOT ESTAB	1.14(6/ 10)	LM1 SOUTHWEST	1.47(1/ 1)	0.66(2/ 4)	
		0.98- 1.47	0.75 MILES SW	1.47- 1.47	0.65- 0.68	
BE-7	0.160	0.16(2/ 10)	LM1 SOUTHWEST	0.20(1/ 1)	4 VALUES <LLD	
		0.17- 0.20	0.75 MILES SW	0.20- 0.20		
TL-208	0.120	0.33(10/ 10)	GEORGETOWN, TN	0.42(1/ 1)	0.23(4/ 4)	
		0.24- 0.42	9.0 MILES ENE	0.42- 0.42	0.16- 0.36	
AC-228	0.160	1.05(10/ 10)	LM1 SOUTHWEST	1.38(1/ 1)	0.70(4/ 4)	
		0.76- 1.38	0.75 MILES SW	1.38- 1.38	0.51- 1.15	
PA-234M	NOT ESTAB	2.46(6/ 10)	LM1 SOUTHWEST	2.96(1/ 1)	2.09(3/ 4)	
		2.10- 2.96	0.75 MILES SW	2.96- 2.96	1.89- 2.27	
SR-89	1.500	10 VALUES <LLD			4 VALUES <LLD	
14		ANALYSIS PERFORMED				
SR-90	0.300	0.32(1/ 10)	WORK, TN	0.32(1/ 1)	0.34(2/ 4)	
14		0.32- 0.32	4.5 MILES NNE	0.32- 0.32	0.32- 0.37	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 14

RADIOACTIVITY IN WELL WATER

PCI/L - 0.037 BQ/L

NAME OF FACILITY SEQUOYAH DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]		LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b]	RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	2.400	3.75(	9/ 26)	SQN WELL #6	4.24(	6/ 13)	3.85(	11/ 13)	
99		2.40-	5.36	ONSITE NNE	3.29-	5.36	2.54-	5.11	
GAMMA (NAI)									
24									
BE-7	NOT ESTAB	3.78(	6/ 15)	MAYS FARM	4.17(	3/ 8)	4.80(	2/ 9)	
		0.20-	6.50	0.75 MILES W	0.20-	6.50	4.20-	5.40	
GAMMA (GELI)									
15									
K-40	NOT ESTAB	11.12(	3/ 11)	SQN WELL #6	14.77(	2/ 6)	9.60(	2/ 4)	
		3.41-	24.31	ONSITE NNE	5.24-	24.31	8.54-	10.66	
BI-214	NOT ESTAB	12.82(	7/ 11)	MAYS FARM	19.59(	3/ 5)	63.79(	3/ 4)	
		3.35-	47.38	0.75 MILES W	3.35-	47.38	5.42-	123.86	
PB-214	NOT ESTAB	25.83(	3/ 11)	MAYS FARM	27.17(	2/ 5)	61.98(	3/ 4)	
		7.90-	46.45	0.75 MILES W	7.90-	46.45	3.19-	114.63	
PB-212	NOT ESTAB	0.40(	2/ 11)	SQN WELL #6	0.40(	2/ 6)	0.77(	2/ 4)	
		0.26-	0.54	ONSITE NNE	0.26-	0.54	0.02-	1.53	
TL-208	NOT ESTAB	0.84(	3/ 11)	SQN WELL #6	1.24(	2/ 6)	4 VALUES <LLD		
		0.19-	1.42	ONSITE NNE	1.06-	1.42			
AC-228	NOT ESTAB	11 VALUES <LLD					1.15(	1/ 4)	
							1.15-	1.15	
TRITIUM	330.000	1 VALUES <LLD					4 VALUES <LLD		
12		ANALYSIS PERFORMED							

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 15

RADIOACTIVITY IN PUBLIC WATER SUPPLY

PCI/L - 0.037 BQ/L

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)[a]	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	2.400	3.10(30/ 52) 2.47- 5.72	CF INDUSTRIES TRM 473.0	3.29(12/ 13) 2.47- 5.72	4.22(14/ 26) 2.41- 8.68	
78						
GAMMA (NAI)						
61						
FE-59	NOT ESTAB	4.75(11/ 43) 1.90- 8.80	DAISY, TN 5.5 MILES W	7.50(1/ 11) 7.50- 7.50	4.13(6/ 19) 0.00- 7.00	
GAMMA (GELI)						
47						
K-40	NOT ESTAB	5.17(4/ 9) 2.62- 13.12	CF INDUSTRIES TRM 473.0	10.07(2/ 3) 7.02- 13.12	2.48(1/ 6) 2.48- 2.48	
BI-214	NOT ESTAB	7.42(4/ 9) 2.55- 15.00	CHICKAMAUGA DAM TRM 465.3	12.31(2/ 2) 9.03- 15.00	9.36(7/ 8) 1.88- 19.42	
PB-214	NOT ESTAB	6.99(6/ 9) 2.58- 10.24	E.I. DUPONT TRM 473.5	9.89(1/ 2) 9.89- 9.89	6.14(5/ 2) 3.37- 10.41	
PB-212	NOT ESTAB	1.24(2/ 9) 0.53- 1.95	CF INDUSTRIES TRM 473.0	1.95(1/ 3) 1.95- 1.95	1.60(2/ 8) 0.27- 2.93	
TL-208	NOT ESTAB	2.02(1/ 9) 2.02- 2.02	CF INDUSTRIES TRM 473.0	2.02(1/ 3) 2.02- 2.02	1.15(2/ 8) 0.90- 1.39	
SR-89	10.000	16 VALUES <LLD			5 VALUES <LLD	
24		ANALYSIS PERFORMED				
SR-90	2.000	16 VALUES <LLD			8 VALUES <LLD	
24		ANALYSIS PERFORMED				
TRITIUM	330.000	16 VALUES <LLD			333.07(1/ 8) 333.07- 333.07	
24						

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Table 16

ENVIRONMENTAL GAMMA RADIATION LEVELS

Average External Gamma Radiation Levels at Various Distances from Sequoyah Nuclear Plant for Each Quarter - 1981
mR/Quarter[a]

Distance miles	Average External Gamma Radiation Levels[b]			
	1st Quarter (Feb-Apr 81)	2nd Quarter (May-Jul 81)	3rd Quarter (Aug-Oct 81)	4th Quarter (Nov 81-Jan 82)
0-1	18.6 ± 1.2	17.4 ± 1.9	20.7 ± 1.8	18.3 ± 1.4
1-2	17.9 ± 3.5	15.5 ± 2.7	18.1 ± 3.5	16.0 ± 3.3
2-4	15.6 ± 2.2	14.3 ± 2.4	16.4 ± 2.5	14.8 ± 2.1
4-6	15.8 ± 1.7	14.2 ± 1.9	16.8 ± 2.5	15.6 ± 1.8
>6	15.8 ± 2.0	14.3 ± 1.2	16.9 ± 1.3	15.3 ± 1.4
Average, 0-2 miles (Onsite)	18.3 ± 2.4	16.6 ± 2.4	19.6 ± 2.8	17.2 ± 2.7
Average, >2 miles (Offsite)	15.7 ± 1.8	14.3 ± 1.8	16.8 ± 2.2	15.3 ± 1.7

a. Data normalized to one quarter (2190 hours).
b. All averages reported ±1s (68 percent confidence level).

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TABLE 17

RADIOACTIVITY IN FOOD CROPS

PCI/KG - 0.037 BQ/KG (WET WT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RADIOACTIVITY IN APPLES						
GROSS BETA 2	NOT ESTAB	2891.60(1/ 1) 2891.60- 2891.60	HARRISON BAY, TN 3.5 MILES SE	2891.60(1/ 1) 2891.60- 2891.60	1302.45(1/ 1) 1302.45- 1302.45	
GAMMA (GELI) 2						
CS-137	NOT ESTAB	4.31(1/ 1) 4.31- 4.31	HARRISON BAY, TN 3.5 MILES SE	4.31(1/ 1) 4.31- 4.31	1 VALUES <LLD	
K-40	NOT ESTAB	1136.09(1/ 1) 1136.09- 1136.09	HARRISON BAY, TN 3.5 MILES SE	1136.09(1/ 1) 1136.09- 1136.09	764.07(1/ 1) 764.07- 764.07	
BI-214	NOT ESTAB	11.26(1/ 1) 11.26- 11.26	HARRISON BAY, TN 3.5 MILES SE	11.26(1/ 1) 11.26- 11.26	15.05(1/ 1) 15.05- 15.05	
PB-214	NOT ESTAB	5.23(1/ 1) 5.23- 5.23	HARRISON BAY, TN 3.5 MILES SE	5.23(1/ 1) 5.23- 5.23	7.95(1/ 1) 7.95- 7.95	
TL-208	NOT ESTAB	1 VALUES <LLD			1.68(1/ 1) 1.68- 1.68	
RADIOACTIVITY IN CABBAGE						
GROSS BETA 2	25.000	3191.99(1/ 1) 3191.99- 3191.99	1 MILES NW	3191.99(1/ 1) 3191.99- 3191.99	3805.38(1/ 1) 3805.38- 3805.38	
GAMMA (GELI) 2						
K-40	NOT ESTAB	1498.10(1/ 1) 1498.10- 1498.10	1 MILES NW	1498.10(1/ 1) 1498.10- 1498.10	1805.53(1/ 1) 1805.53- 1805.53	
BI-214	NOT ESTAB	1 VALUES <LLD			6.45(1/ 1) 6.45- 6.45	
PB-214	NOT ESTAB	1 VALUES <LLD			6.78(1/ 1) 6.78- 6.78	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 17 (CONTD)

RADIOACTIVITY IN FOOD CROPS

PCI/KG - 0.037 BQ/KG (WET WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RADIOACTIVITY IN CORN						
GROSS BETA 2	25.000	3714.30(1/ 1) 3714.30- 3714.30	1 MILES NW	3714.30(1/ 1) 3714.30- 3714.30	3650.05(1/ 1) 3650.05- 3650.05	
GAMMA (GELI) 2						
CS-137	5.000	7.58(1/ 1) 7.58- 7.58	1 MILES NW	7.58(1/ 1) 7.58- 7.58	6.05(1/ 1) 6.05- 6.05	
K-40	NOT ESTAB	2241.98(1/ 1) 2241.98- 2241.98	1 MILES NW	2241.98(1/ 1) 2241.98- 2241.98	2033.71(1/ 1) 2033.71- 2033.71	
BI-214	NOT ESTAB	1 VALUES <LLD			12.03(1/ 1) 12.03- 12.03	
PB-214	NOT ESTAB	1 VALUES <LLD			7.59(1/ 1) 7.59- 7.59	
PB-212	NOT ESTAB	0.23(1/ 1) 0.23- 0.23	1 MILES NW	0.23(1/ 1) 0.23- 0.23	1 VALUES <LLD	
RADIOACTIVITY IN GREEN BEANS						
GROSS BETA 2	25.000	3118.50(1/ 1) 3118.50- 3118.50	1 MILES NW	3118.50(1/ 1) 3118.50- 3118.50	5560.41(1/ 1) 5560.41- 5560.41	
GAMMA (GELI) 2						
K-40	NOT ESTAB	1800.09(1/ 1) 1800.09- 1800.09	1 MILES NW	1800.09(1/ 1) 1800.09- 1800.09	2558.47(1/ 1) 2558.47- 2558.47	
BI-214	NOT ESTAB	1 VALUES <LLD			17.84(1/ 1) 17.84- 17.84	
PB-214	NOT ESTAB	1 VALUES <LLD			15.79(1/ 1) 15.79- 15.79	
PB-212	NOT ESTAB	3.97(1/ 1) 3.97- 3.97	1 MILES NW	3.97(1/ 1) 3.97- 3.97	0.33(1/ 1) 0.33- 0.33	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 17 (CONTD)

RADIOACTIVITY IN FOOD CROPS

PCI/KG - 0.037 BQ/KG (WET WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RADIOACTIVITY IN POTATOES						
GROSS BETA 2	25.000	6736.41(1/ 1) 6736.41- 6736.41	1 MILES NW	6736.41(1/ 1) 6736.41- 6736.41	6204.73(1/ 1) 6204.73- 6204.73	
GAMMA (GELI) 2						
CS-137	5.000	1 VALUES <LLD			13.99(1/ 1) 13.99- 13.99	
K-40	NOT ESTAB	3332.33(1/ 1) 3332.33- 3332.33	1 MILES NW	3332.33(1/ 1) 3332.33- 3332.33	2864.60(1/ 1) 2864.60- 2864.60	
BI-214	NOT ESTAB	1 VALUES <LLD			0.12(1/ 1) 0.12- 0.12	
PB-214	NOT ESTAB	4.27(1/ 1) 4.27- 4.27	1 MILES NW	4.27(1/ 1) 4.27- 4.27	1 VALUES <LLD	
RADIOACTIVITY IN TOMATOES						
GROSS BETA 2	25.000	5265.13(1/ 1) 5265.13- 5265.13	JONES FARM 1.25 MILES W	5265.13(1/ 1) 5265.13- 5265.13	3263.63(1/ 1) 3263.63- 3263.63	
GAMMA (GELI) 2						
CS-137	5.000	5.63(1/ 1) 5.63- 5.63	JONES FARM 1.25 MILES W	5.63(1/ 1) 5.63- 5.63	1 VALUES <LLD	
K-40	NOT ESTAB	2281.38(1/ 1) 2281.38- 2281.38	JONES FARM 1.25 MILES W	2281.38(1/ 1) 2281.38- 2281.38	1835.24(1/ 1) 1835.24- 1835.24	
BI-214	NOT ESTAB	1 VALUES <LLD			4.44(1/ 1) 4.44- 4.44	
PB-214	NOT ESTAB	1 VALUES <LLD			3.78(1/ 1) 3.78- 3.78	
PB-212	NOT ESTAB	3.07(1/ 1) 3.07- 3.07	JONES FARM 1.25 MILES W	3.07(1/ 1) 3.07- 3.07	1 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 17 (CONTD)

RADIOACTIVITY IN FOOD CROPS

PCI/KG - 0.037 PG/KG (WET WT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RADIOACTIVITY IN TURNIP GREENS						
GROSS BETA 2	25.000	4866.95(1/ 1) 4866.95- 4866.95	LOVELL FARM 2.75 MILES NNE	4866.95(1/ 1) 4866.95- 4866.95	5642.29(1/ 1) 5642.29- 5642.29	
GAMMA (GELI) 2						
K-40	NOT ESTAB	2349.59(1/ 1) 2349.59- 2349.59	LOVELL FARM 2.75 MILES NNE	2349.59(1/ 1) 2349.59- 2349.59	2444.09(1/ 1) 2444.09- 2444.09	
BI-214	NOT ESTAB	19.00(1/ 1) 19.00- 19.00	LOVELL FARM 2.75 MILES NNE	19.00(1/ 1) 19.00- 19.00	9.90(1/ 1) 9.90- 9.90	
BI-212	NOT ESTAB	96.59(1/ 1) 96.59- 96.59	LOVELL FARM 2.75 MILES NNE	96.59(1/ 1) 96.59- 96.59	1 VALUES <LLD	
PB-214	NOT ESTAB	11.51(1/ 1) 11.51- 11.51	LOVELL FARM 2.75 MILES NNE	11.51(1/ 1) 11.51- 11.51	8.66(1/ 1) 8.66- 8.66	
PB-212	NOT ESTAB	98.86(1/ 1) 98.86- 98.86	LOVELL FARM 2.75 MILES NNE	98.86(1/ 1) 98.86- 98.86	7.65(1/ 1) 7.65- 7.65	
RA-226	NOT ESTAB	1 VALUES <LLD			2.86(1/ 1) 2.86- 2.86	
BE-7	NOT ESTAB	1 VALUES <LLD			47.30(1/ 1) 47.30- 47.30	
TL-208	NOT ESTAB	34.67(1/ 1) 34.67- 34.67	LOVELL FARM 2.75 MILES NNE	34.67(1/ 1) 34.67- 34.67	2.15(1/ 1) 2.15- 2.15	
AC-228	NOT ESTAB	15.60(1/ 1) 15.60- 15.60	LOVELL FARM 2.75 MILES NNE	15.60(1/ 1) 15.60- 15.60	25.49(1/ 1) 25.49- 25.49	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 18

RADIOACTIVITY IN POULTRY

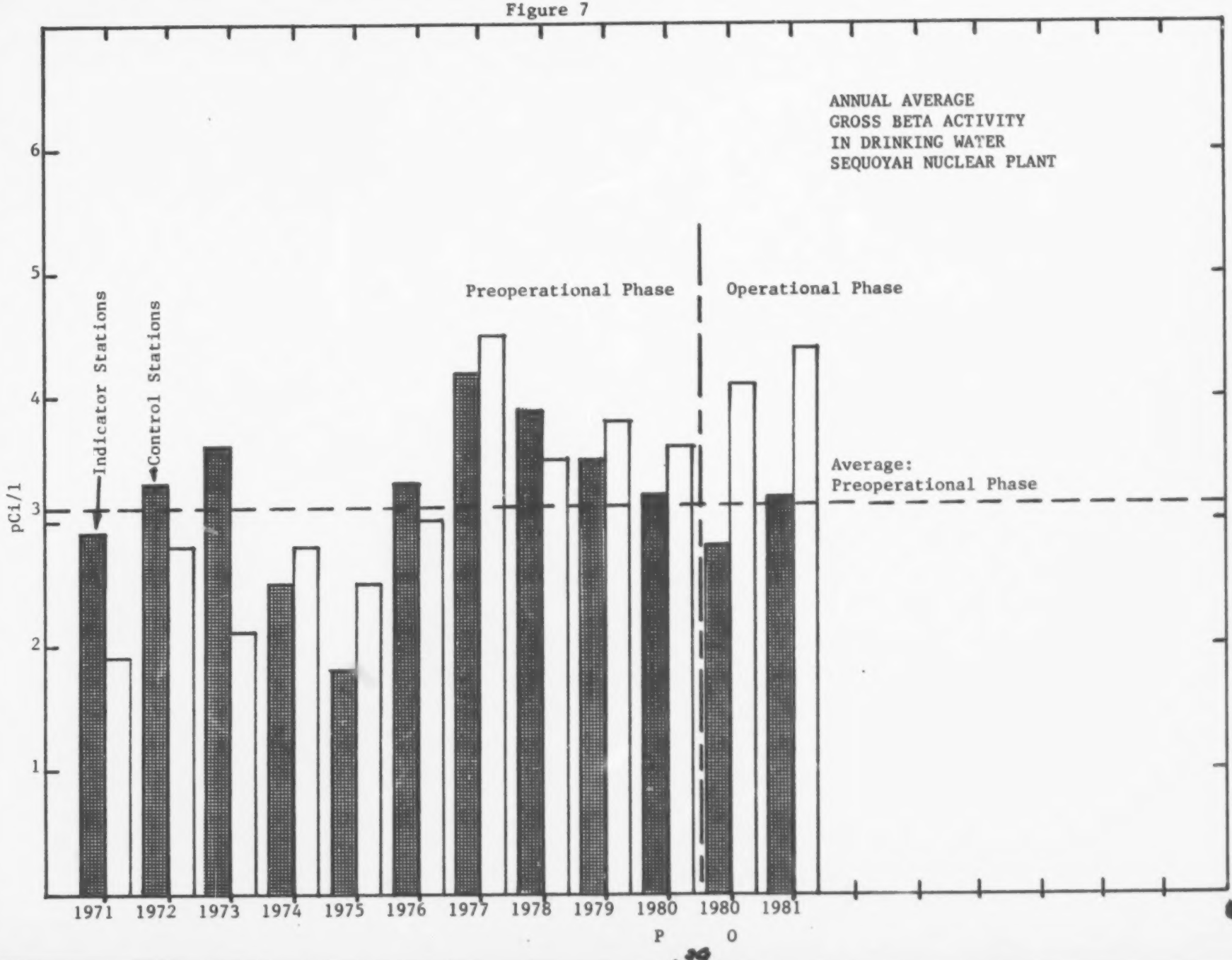
PCI/KG - 0.037 BQ/KG (WET WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS[a] MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA (GELI) 2						
K-40	NOT ESTAB	1142.72(1/ 1) 1142.72- 1142.72	LOVELL FARM 2.75 MILES NNE	1142.72(1/ 1) 1142.72- 1142.72	1183.37(1/ 1) 1183.37- 1183.37	
BI-214	NOT ESTAB	2.40(1/ 1) 2.40- 2.40	LOVELL FARM 2.75 MILES NNE	2.40(1/ 1) 2.40- 2.40	14.23(1/ 1) 14.23- 14.23	
PB-214	NOT ESTAB	0.12(1/ 1) 0.12- 0.12	LOVELL FARM 2.75 MILES NNE	0.12(1/ 1) 0.12- 0.12	7.22(1/ 1) 7.22- 7.22	
PB-212	NOT ESTAB	0.18(1/ 1) 0.18- 0.18	LOVELL FARM 2.75 MILES NNE	0.18(1/ 1) 0.18- 0.18	1 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Figure 7



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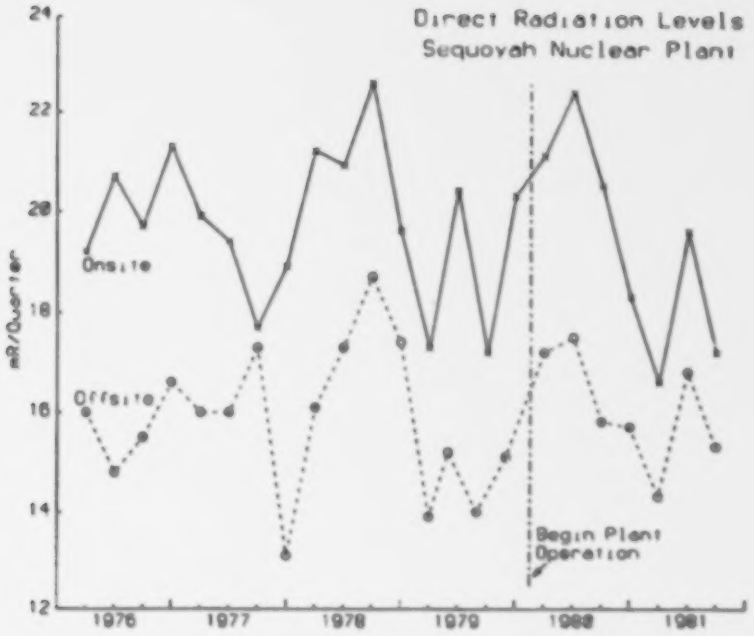

Figure 8

Figure 9

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Reservoir Monitoring

Samples are collected from the Tennessee River as detailed in table 19. Samples collected for radiological analysis include water and Asiatic clams from three of these cross sections, sediment from four cross sections, and fish from three contiguous reservoirs. The locations of these cross sections are shown on the accompanying map (figure 10) and conform to sediment ranges established and surveyed by TVA.

Water

Water samples are collected automatically by sequential type sampling devices at three cross sections and composite samples analyzed monthly for gross alpha and beta activity and gamma-emitting radionuclides. Further composites are made quarterly for strontium and tritium analyses. Results are displayed in table 20. Figure 11 presents a plot of the gross beta activity in surface water from 1971 through 1981. Indicator stations are those located downstream from the plant and controls are located upstream. The levels reported are consistent with gross beta levels measured in surface water samples taken from the Tennessee River in preoperational monitoring programs conducted by TVA at other sites.

Fish

Radiological monitoring for fish was accomplished by analyses of composite samples of adult fish taken semiannually from each of three contiguous reservoirs--Watts Bar, Chickamauga, and Nickajack. No permanent sampling stations have been established within each reservoir; this reflects the movement of fish species within reservoirs as determined by TVA data from the Browns Ferry Nuclear Plant preoperational monitoring program. Three species, white crappie, channel catfish, and smallmouth buffalo, are collected representing both commercial and game species. Sufficient fish are collected in each reservoir to yield 250 or 300 grams oven-dry weight for analytical purposes. All samples were analyzed for gamma, gross alpha, and gross beta activity. In addition, two samples of each species were analyzed for ^{89}Sr, and ^{90}Sr. The composite samples contained approximately the same quantity of flesh from each fish. For each composite a subsample of material was drawn for counting. Results are given in tables 21, 22, 23, and 24. During this reporting period an insufficient sample of each species (four samples) was available for analysis in the first sampling period.

Sediment

Sediment samples were collected semiannually from dredge hauls made for bottom fauna. Gamma, gross alpha, and gross beta activity and ^{89}Sr and ^{90}Sr content were determined in samples collected from points in four cross sections. Each sample was a composite obtained by combining equal volumes of sediment from each of three dredge hauls at a point in the cross section. Results are given in table 25. In accordance with the Watts Bar Nuclear Plant monitoring program, samples from the upstream station were collected quarterly.

In addition to the sampling described above, shoreline sediment samples were collected at three recreation-use areas (two downstream from the plant and one upstream) in the vicinity of SQN. Samples were taken in June and November and analyzed for gross alpha, gross beta, gamma-emitting radionuclides, ^{89}Sr, and ^{90}Sr. Results are given in table 26.

Asiatic Clams

Samples of Asiatic clams were collected semiannually with a Ponar dredge from three stations and analyzed for gamma, gross alpha, and gross beta activity. The ^{89}Sr and ^{90}Sr content was determined in the shells. At the upstream station, which is also a part of the Watts Bar Nuclear Plant monitoring program, samples were collected quarterly. Results are given in tables 27 and 28.

Table 19

SAMPLING SCHEDULE - RESERVOIR MONITORING

Tennessee River (Mile)	Biological Samples				Water Samples
	Benthic Fauna	Sediment	Shoreline Sediment	Fish[a]	
472.8		X			
473.2					Automatic sampler[b]
477.5			X		
478.3			X		
480.8	X	X			
483.4	X	X			Automatic sampler[b]
485.2			X		
496.5 (Control)	X	X			
497.0 (Control)					Automatic sampler[b]

a. Fish samples are taken from Watts Bar, Chickamauga, and Nickajack Reservoirs.

b. Composite sample analyzed monthly.

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TABLE 20

RADIOACTIVITY IN SURFACE WATER TOTAL

PCI/L - 3.037 BQ/L

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS[c] MEAN (F) RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	2.000	3.22(37/ 26)	TRM 473.2	3.89(1/ 13)	2.05(2/ 13)	
52		2.40- 3.89		3.89- 3.89	2.02- 2.08	
GROSS BETA	2.400	4.66(25/ 26)	TRM 473.4	4.81(13/ 13)	4.97(10/ 13)	
5		2.56- 8.39		2.84- 8.39	3.01- 7.51	
GAMMA (NAI)						
31						
FE-59	NOT ESTAB	5.26(11/ 21)	TRM 473.4	6.77(6/ 10)	5.53(3/ 10)	
		0.00- 9.79		4.48- 9.79	3.80- 7.20	
GAMMA (GELI)						
K-40	NOT ESTAB	17.42(3/ 5)	TRM 483.4	22.36(2/ 3)	3 VALUES <LLD	
		2.62- 42.00		2.62- 42.00		
BI-214	NOT ESTAB	8.53(4/ 5)	TRM 483.4	9.64(3/ 3)	3 VALUES <LLD	
		4.61- 15.00		5.73- 15.00		
PB-214	NOT ESTAB	10.24(1/ 5)	TRM 483.4	10.24(1/ 3)	3 VALUES <LLD	
		10.24- 10.24		10.24- 10.24		
BI-212	NOT ESTAB	5 VALUES <LLD			5.03(1/ 3)	
					5.03- 5.03	
SR-89	10.000	7 VALUES <LLD			4 VALUES <LLD	
11		ANALYSIS PERFORMED				
SR-90	2.000	7 VALUES <LLD			4 VALUES <LLD	
11		ANALYSIS PERFORMED				
TRITIUM	330.000	345.93(2/ 7)	TRM 473.2	439.01(1/ 4)	401.73(1/ 4)	
11		332.65- 439.01		439.01- 439.01	401.73- 401.73	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 21

RADIOACTIVITY IN WHITE CRAPPIE (FLESH)

PCI/G = 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.100	2.97(3/ 3)	CHICKAMAUGA RES	2.97(2/ 2)	3.73(2/ 2)	
5		2.50- 3.27	TRM 471-530	2.66- 3.27	2.73- 4.73	
GROSS BETA	0.100	29.13(3/ 3)	CHICKAMAUGA RES	30.02(2/ 2)	37.86(2/ 2)	
5		25.39- 34.64	TRM 471-530	25.39- 34.64	35.17- 40.55	
GAMMA (GELI)						
5						
CS-137	0.020	0.12(3/ 3)	CHICKAMAUGA RES	0.14(2/ 2)	0.18(2/ 2)	
		0.09- 0.15	TRM 471-530	0.12- 0.15	0.17- 0.18	
K-40	NOT ESTAB	15.46(3/ 3)	CHICKAMAUGA RES	16.10(2/ 2)	15.93(2/ 2)	
		13.97- 18.23	TRM 471-530	13.97- 18.23	15.40- 16.46	
BI-214	0.020	0.03(3/ 3)	NICKAJACK RES	0.03(1/ 1)	2 VALUES <LLD	
		0.01- 0.03	TRM 425-471	0.03- 0.03		
PB-214	NOT ESTAB	0.03(1/ 3)	CHICKAMAUGA RES	0.03(1/ 2)	2 VALUES <LLD	
		0.03- 0.03	TRM 471-530	0.03- 0.03		
PB-212	NOT ESTAB	0.01(2/ 3)	CHICKAMAUGA RES	0.01(2/ 2)	2 VALUES <LLD	
		0.01- 0.01	TRM 471-530	0.01- 0.01		
TL-208	NOT ESTAB	0.01(1/ 3)	CHICKAMAUGA RES	0.01(1/ 2)	0.01(1/ 2)	
		0.01- 0.01	TRM 471-530	0.01- 0.01	0.01- 0.01	
SR-89	0.500	1.41(1/ 1)	CHICKAMAUGA RES	1.41(1/ 1)	0.86(1/ 1)	
2		1.41- 1.41	TRM 471-530	1.41- 1.41	0.86- 0.86	
SR-90	0.100	ANALYSIS PERFORMED			1 VALUES <LLD	
2		1 VALUE <LLD				

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 22

RADIOACTIVITY IN CHANNEL CATFISH (FLESH)

(pCi/g - +0.037 Bq/g (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.100	2.24(3/ 3)	NICKAJACK RES	3.36(1/ 1)	2.99(2/ 2)	
5		1.62- 3.36	TRM 425-471	3.36- 3.36)	2.68- 3.30	
GROSS BETA	0.100	21.40(3/ 3)	NICKAJACK RES	23.64(1/ 1)	25.47(2/ 2)	
5		15.50- 25.06	TRM 425-471	23.64- 23.64	24.35- 26.58	
GAMMA (GELI)						
5						
CS-137	0.020	0.07(3/ 3)	NICKAJACK RES	0.07(1/ 1)	0.05(2/ 2)	
		0.05- 0.08)	TRM 425-471	0.07- 0.07	0.03- 0.07	
K-40	NOT ESTAB	11.51(3/ 3)	CHICKAMAUGA RES	11.66(2/ 2)	12.83(2/ 2)	
		10.07- 13.24	TRM 471-530	10.07- 13.24	10.44- 15.22	
BI-214	0.020	3 VALUES <LLD			0.02(1/ 2)	
					0.02- 0.02	
PB-214	NOT ESTAB	0.02(1/ 3)	CHICKAMAUGA RES	0.02(1/ 2)	0.02(2/ 2)	
		0.02- 0.02	TRM 471-530	0.02- 0.02	0.01- 0.02	
PB-212	NOT ESTAB	0.00(1/ 3)	CHICKAMAUGA RES	0.00(1/ 2)	0.00(2/ 2)	
		0.00- 0.00	TRM 471-530	0.00- 0.00	0.00- 0.00	
TL-208	NOT ESTAB	0.00(1/ 3)	CHICKAMAUGA RES	0.00(1/ 2)	1 VALUE <LLD	
		0.00- 0.00	TRM 471-530	0.00- 0.00		
SR 89	0.500	ANALYSIS PERFORMED			1 VALUE <LLD	
2		1 VALUE <LLD				
SR 90	0.100	ANALYSIS PERFORMED			1 VALUE <LLD	
2		1 VALUE <LLD				

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 23

RADIOACTIVITY IN SMALLMOUTH BUFFALO (FLESH)

PCI/G - 3.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.100	2.25(3/ 3)	CHICKAMAUGA RES	2.31(2/ 2)	2.58(2/ 2)	
5		1.94- 2.67	TRM 471-530	1.94- 2.67	2.63- 4.53	
GROSS BETA	0.100	18.91(3/ 3)	CHICKAMAUGA RES	19.63(2/ 2)	34.87(2/ 2)	
5		17.46- 20.33	TRM 471-530	18.93- 20.33	25.38- 44.36	
GAMMA (GELI)						
5						
CO-60	0.010	0.02(1/ 3)	CHICKAMAUGA RES	0.02(1/ 2)	1 VALUE <LLD	
		0.02- 0.02	TRM 471-530	0.02- 0.02		
CS-137	0.020	0.06(3/ 3)	CHICKAMAUGA RES	0.06(2/ 2)	0.08(2/ 2)	
		0.04- 0.08	TRM 471-530	0.64- 0.08	0.05- 0.11	
K-40	NOT ESTAB	9.65(3/ 3)	CHICKAMAUGA RES	9.70(2/ 2)	12.69(2/ 2)	
		8.65- 10.75	TRM 471-530	8.65- 10.75	11.88- 13.50	
BI-214	0.020	0.01(2/ 3)	CHICKAMAUGA RES	0.01(1/ 2)	0.04(2/ 2)	
		0.00- 0.01	TRM 471-530	0.01- 0.01	0.04- 0.04	
PB-214	NOT ESTAB	0.01(1/ 3)	NICKAJACK RES	0.01(1/ 1)	0.02(2/ 2)	
		0.01- 0.01	TRM 425-471	0.01- 0.01	0.02- 0.03	
AC-228	NOT ESTAB	1 VALUE <LLD			0.03(1/ 2)	
					0.03- 0.03	
SR 89	0.500	ANALYSIS PERFORMED			1.91(1/ 1)	
2		1 VALUE <LLD			1.91- 1.91	
SR 90	0.100	ANALYSIS PERFORMED			1 VALUE <LLD	
2		1 VALUE <LLD				

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 24

RADIOACTIVITY IN SMALLMOUTH BUFFALO (WHOLE)

PCI/G - 3.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.100	1.96(3/ 3)	CHICKAMAUGA RES	3.06(1/ 1)	1.45(2/ 2)	
5		0.83- 3.06	TRM 471-530	3.06- 3.06	1.45- 1.45	
GROSS BETA	0.100	13.06(3/ 3	CHICKAMAUGA RES	14.14(1/ 1)	13.99(2/ 2)	
5		10.62- 14.35	TRM 471-530	14.14- 14.14	13.04- 14.93	
GAMMA (GELI)						
5						
CO-60	0.010	3 VALUES <LLD			0.02(2/ 2)	
					0.02- 0.02	
CS-137	0.020	0.04(2/ 3)	NICKAJACK RES	0.04(2/ 2)	0.06(2/ 2)	
		0.03- 0.04	TRM 425-471	0.03- 0.04	0.06- 0.06	
K-40	NOT ESTAB	5.50(3/ 3)	CHICKAMAUGA RES	5.55(1/ 1)	6.24(2/ 2)	
		5.11- 5.84	TRM 471-530	5.55- 5.55	5.70- 6.77	
BI-214	0.020	0.01(2/ 3)	NICKAJACK RES	0.02(1/ 2)	0.01(1/ 2)	
		0.01- 0.02	TRM 425-471	0.02- 0.02	0.01- 0.01	
PB-214	NOT ESTAB	0.02(2/ 3)	CHICKAMAUGA RES	0.02(1/ 1)	0.02(2/ 2)	
		0.02- 0.02	TRM 471-530	0.02- 0.02	0.02- 0.02	
PB-212	NOT ESTAB	0.02(2/ 3)	CHICKAMAUGA RES	0.02(1/ 1)	0.01(2/ 2)	
		0.02- 0.02	TRM 471-530	0.02- 0.02	0.00- 0.01	
TL-208	NOT ESTAB	0.01(1/ 3)	CHICKAMAUGA RES	0.01(1/ 1)	0.01(1/ 2)	
		0.01- 0.01	TRM 471-530	0.01- 0.01	0.01- 0.01	
SR 89	0.500	ANALYSIS PERFORMED			1.56(1/ 1)	
2		1 VALUE <LLD			1.56- 1.56	
SR 90	0.100	0.29(1/ 1)	NICKAJACK RES	0.29(1/ 1)	0.19(1/ 1)	
2		0.29- 0.29	TRM 425-471	0.29- 0.29	0.19- 0.19	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 25

RADIOACTIVITY IN SEDIMENT

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSES PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]		LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]		CONTROL LOCATIONS MEAN (F)[b] RANGE[b]		NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.350	3.29(	6/ 6)	TRM 472.90	4.41(	2/ 2)	3.48(	4/ 4)	
1		1.49-	4.49		4.36-	4.45	2.31-	4.68	
GROSS BETA	0.783	32.00(	6/ 6)	TRM 472.80	39.94(	2/ 2)	29.48(	4/ 4)	
1		16.43-	41.45		38.43-	41.45	23.36-	35.53	
GAMMA (GPLI)									
1									
CE-144	0.060	0.29(	1/ 6)	TRM 480.62	0.28(	1/ 2)	0.13(	2/ 4)	
		0.28-	0.28		0.28-	0.28	0.12-	0.14	
CO-60	0.010	0.15(	6/ 6)	TRM 472.80	0.26(	2/ 2)	0.19(	4/ 4)	
		0.04-	0.32		0.25-	0.27	0.12-	0.28	
CS-137	0.020	2.64(	6/ 6)	TRM 472.85	4.19(	2/ 2)	1.81(	4/ 4)	
		0.23-	4.75		3.71-	4.67	1.05-	2.68	
ZR-95	0.035	6 VALUES <LLD					0.06(	1/ 4)	
							0.06-	0.06	
NB-95	0.010	0.04(	2/ 6)	TRM 480.62	0.11(	1/ 2)	0.12(	3/ 4)	
		0.07-	0.11		0.11-	0.11	0.07-	0.19	
CO-58	0.010	0.05(	1/ 6)	TRM 480.62	0.05(	1/ 2)	4 VALUES <LLD		
		0.05-	0.05		0.05-	0.05			
K-40	NOT ESTAB	16.42(	6/ 6)	TRM 472.80	19.16(	2/ 2)	15.25(	4/ 4)	
		10.66-	20.36		16.19-	20.13	12.45-	17.74	
MN-54	0.010	0.06(	2/ 6)	TRM 480.62	0.12(	1/ 2)	0.01(	1/ 4)	
		0.04-	0.12		0.12-	0.12	0.01-	0.01	
BI-214	0.020	1.10(	6/ 6)	TRM 472.80	1.48(	2/ 2)	1.03(	4/ 4)	
		0.45-	1.63		1.34-	1.63	0.81-	1.34	
BI-212	0.130	1.98(	6/ 6)	TRM 472.80	2.46(	2/ 2)	1.56(	4/ 4)	
		0.88-	2.84		2.06-	2.84	1.24-	1.97	
PB-214	NOT ESTAB	1.34(	6/ 6)	TRM 472.80	1.63(	2/ 2)	1.12(	4/ 4)	
		0.55-	1.85		1.47-	1.80	0.86-	1.48	
PB-212	NOT ESTAB	1.78(	6/ 6)	TRM 472.80	2.19(	2/ 2)	1.48(	4/ 4)	
		0.75-	2.81		2.06-	2.31	1.06-	1.99	
RA-226	NOT ESTAB	1.10(	6/ 6)	TRM 472.80	1.48(	2/ 2)	1.03(	4/ 4)	
		0.45-	1.63		1.34-	1.63	0.81-	1.34	
TH-228	NOT ESTAB	1.90(	6/ 6)	TRM 472.80	2.25(	2/ 2)	1.47(	4/ 4)	
		1.04-	2.54		1.96-	2.54	0.98-	2.01	
TL-208	0.020	0.51(	6/ 6)	TRM 472.80	0.63(	2/ 2)	0.42(	4/ 4)	
		0.22-	0.79		0.55-	0.70	0.33-	0.57	
AC-228	0.060	1.66(	6/ 6)	TRM 472.80	1.95(	2/ 2)	1.39(	4/ 4)	
		0.74-	2.22		1.88-	2.01	1.07-	1.95	
PA-234M	NOT ESTAB	4.83(	2/ 6)	TRM 472.90	6.79(	1/ 2)	4.16(	2/ 4)	
		2.95-	6.79		6.78-	6.78	3.69-	4.64	
U-NAT	1.500	6 VALUES <LLD					3.25(	1/ 4)	
1							3.25-	3.25	
SR-90	0.500	6 VALUES <LLD					4 VALUES <LLD		
1		ANALYSIS PERFORMED							

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 26

RADIOACTIVITY IN SHORE LINE SEDIMENT

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. SQNP TEST RUN APR 6,82
LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	NOT ESTAB	3.58 (4/ 4)	TRM 478	2.81 (2/ 2)	1.89 (2/ 2)	
6		1.73 - 3.36		2.25 - 2.48	1.31 - 2.48	
GROSS BETA	NOT ESTAB	16.57 (4/ 4)	TRM 478	22.69 (2/ 2)	12.66 (2/ 2)	
6		7.98 - 37.31		8.07 - 37.31	9.82 - 15.50	
GAMMA (GELI)						
6						
CO-60	NOT ESTAB	0.01 (1/ 4)	TRM 477	0.01 (1/ 2)	2 VALUES <LLD	
		0.01 - 0.01		0.01 - 0.01		
CS-137	NOT ESTAB	0.05 (3/ 4)	TRM 478	0.09 (1/ 2)	0.06 (2/ 2)	
		0.02 - 0.09		0.09 - 0.09	0.02 - 0.10	
K-40	NOT ESTAB	8.51 (4/ 4)	TRM 478	14.17 (2/ 2)	5.40 (2/ 2)	
		2.04 - 25.40		2.95 - 25.40	4.49 - 6.30	
BI-214	NOT ESTAB	0.72 (4/ 4)	TRM 477	0.90 (2/ 2)	0.63 (2/ 2)	
		0.47 - 1.05		0.74 - 1.05	0.53 - 0.72	
BI-212	NOT ESTAB	1.14 (4/ 4)	TRM 478	1.34 (2/ 2)	0.95 (2/ 2)	
		0.68 - 1.83		0.85 - 1.83	0.91 - 1.00	
PB-214	NOT ESTAB	0.81 (4/ 4)	TRM 477	0.98 (2/ 2)	0.69 (2/ 2)	
		0.51 - 1.18		0.78 - 1.18	0.59 - 0.79	
PB-212	NOT ESTAB	1.01 (4/ 4)	TRM 478	1.22 (2/ 2)	0.79 (2/ 2)	
		0.62 - 1.63		0.81 - 1.63	0.71 - 0.86	
RA-226	NOT ESTAB	0.72 (4/ 4)	TRM 477	0.90 (2/ 2)	0.63 (2/ 2)	
		0.47 - 1.05		0.74 - 1.05	0.53 - 0.72	
RA-224	NOT ESTAB	1.07 (4/ 4)	TRM 478	1.28 (2/ 2)	0.88 (2/ 2)	
		0.69 - 1.66		0.91 - 1.66	0.88 - 0.89	
TL-208	NOT ESTAB	0.30 (4/ 4)	TRM 478	0.36 (2/ 2)	0.24 (2/ 2)	
		0.19 - 0.49		0.24 - 0.49	0.22 - 0.26	
AC-228	NOT ESTAB	0.99 (4/ 4)	TRM 478	1.21 (2/ 2)	0.81 (2/ 2)	
		0.58 - 1.60		0.81 - 1.60	0.76 - 0.86	
PA-234M	NOT ESTAB	2.20 (1/ 4)	TRM 477	2.20 (1/ 2)	2 VALUES <LLD	
		2.20 - 2.20		2.20 - 2.20		
SR 89	NOT ESTAB	0.31 (4/ 4)	TRM 477	0.53 (2/ 2)	0.33 (2/ 2)	
6		0.02 - 1.03		0.04 - 1.03	0.20 - 0.46	
SR 90	NOT ESTAB	0.13 (4/ 4)	TRM 477	0.14 (2/ 2)	0.08 (2/ 2)	
6		0.18 - 0.16		0.12 - 0.16	0.01 - 0.15	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 27

RADIOACTIVITY IN CLAM FLESH

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.109	2.90(4/ 4) 1.26- 4.54	TRM 490.82	3.58(2/ 2) 2.33- 4.84	3.52(4/ 4) 2.21- 5.49	
GROSS BETA	0.190	9.71(4/ 4) 3.07- 16.59	TRM 493.4	9.83(2/ 2) 3.07- 16.59	7.79(4/ 4) 5.68- 12.12	
GAMMA (GELI)						
CO-60	0.086	0.21(3/ 4) 0.18- 0.24	TRM 490.82	0.22(2/ 2) 0.19- 0.24	0.14(1/ 4) 0.14- 0.14	
CS-137	0.080	4 VALUES <LLD			0.14(1/ 4) 0.14- 0.14	
NB-95	0.070	4 VALUES <LLD			0.32(1/ 4) 0.32- 0.32	
CO-58	0.070	0.28(1/ 4) 0.28- 0.28	TRM 483.4	0.28(1/ 2) 0.28- 0.28	4 VALUES <LLD	
K-40	NOT ESTAB	1.53(4/ 4) 0.09- 4.22	TRM 490.82	2.28(2/ 2) 0.35- 4.22	1.72(4/ 4) 0.52- 2.42	
BI-214	NOT ESTAB	0.81(4/ 4) 0.48- 1.12	TRM 490.82	0.82(2/ 2) 0.56- 1.07	1.25(4/ 4) 0.42- 2.47	
PB-214	NOT ESTAB	0.83(4/ 4) 0.44- 1.41	TRM 483.4	0.92(2/ 2) 0.44- 1.41	0.71(4/ 4) 0.39- 1.12	
PB-212	NOT ESTAB	0.08(3/ 4) 0.04- 0.16	TRM 490.82	0.10(2/ 2) 0.04- 0.16	0.13(4/ 4) 0.09- 0.17	
RA-226	NOT ESTAB	4 VALUES <LLD			1.08(1/ 4) 1.08- 1.08	
TL-208	NOT ESTAB	0.06(3/ 4) 0.05- 0.07	TRM 483.4	0.07(1/ 2) 0.07- 0.07	0.05(2/ 4) 0.01- 0.09	
AC-228	NOT ESTAB	0.30(2/ 4) 0.28- 0.33	TRM 483.4	0.33(1/ 2) 0.33- 0.33	0.49(1/ 4) 0.49- 0.49	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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TABLE 28

RADIOACTIVITY IN CLAM SHELL

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY SEQUOYAH — DOCKET NO. 50-327,328

LOCATION OF FACILITY HAMILTON TENNESSEE — REPORTING PERIOD 1981

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA	0.700	0.77(1/ 4) 0.77- 0.77	TRM 480.82	0.77(1/ 2) 0.77- 0.77	4 VALUES <LLD	
GROSS BETA	0.700	4.25(4/ 4) 3.16- 5.35	TRM 480.82	4.57(2/ 2) 3.79- 5.35	4.24(4/ 4) 3.81- 4.58	
GAMMA (GELI)						
CO-60	0.010	0.02(3/ 4) 0.01- 0.03	TRM 483.4	0.02(1/ 2) 0.02- 0.02	0.02(3/ 4) 0.01- 0.02	
CS-137	0.020	0.02(1/ 4) 0.02- 0.02	TRM 480.82	0.02(1/ 2) 0.02- 0.02	4 VALUES <LLD	
K-40	NOT ESTAB	0.08(4/ 4) 0.04- 0.16	TRM 480.82	0.11(2/ 2) 0.07- 0.16	0.11(4/ 4) 0.07- 0.22	
MN-54	0.010	0.04(1/ 4) 0.04- 0.04	TRM 483.4	0.04(1/ 2) 0.04- 0.04	4 VALUES <LLD	
BI-214	0.050	0.12(4/ 4) 0.07- 0.19	TRM 483.4	0.13(2/ 2) 0.07- 0.19	0.11(4/ 4) 0.08- 0.17	
BI-212	0.100	0.24(2/ 4) 0.16- 0.31	TRM 480.82	0.31(1/ 2) 0.31- 0.31	0.16(2/ 4) 0.17- 0.16	
PB-214	0.050	0.12(4/ 4) 0.06- 0.18	TRM 483.4	0.12(2/ 2) 0.06- 0.18	0.13(4/ 4) 0.09- 0.21	
PB-212	NOT ESTAB	0.11(4/ 4) 0.05- 0.23	TRM 480.82	0.14(2/ 2) 0.05- 0.23	0.10(4/ 4) 0.06- 0.15	
RA-226	0.050	0.17(2/ 4) 0.14- 0.19	TRM 483.4	0.19(1/ 2) 0.19- 0.19	0.11(3/ 4) 0.09- 0.12	
TL-208	0.020	0.04(2/ 4) 0.02- 0.06	TRM 480.82	0.06(1/ 2) 0.06- 0.06	0.04(3/ 4) 0.02- 0.05	
AC-228	0.060	0.16(4/ 4) 0.08- 0.24	TRM 483.4	0.16(2/ 2) 0.09- 0.23	0.16(4/ 4) 0.09- 0.21	
PA-234M	NOT ESTAB	1.31(1/ 4) 1.31- 1.31	TRM 483.4	1.31(1/ 2) 1.31- 1.31	1.26(1/ 4) 1.28- 1.28	
SR-90 A	5.000	7.68(1/ 4) 7.68- 7.68	TRM 483.4	7.68(1/ 2) 7.68- 7.68	5.21(1/ 4) 5.21- 5.21	
SR-90 B	1.000	1.24(3/ 4) 1.22- 1.27	TRM 480.82	1.27(1/ 2) 1.27- 1.27	1.54(3/ 4) 1.09- 1.97	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

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Figure 10

RESERVOIR MONITORING NETWORK
SEQUOYAH NUCLEAR PLANT

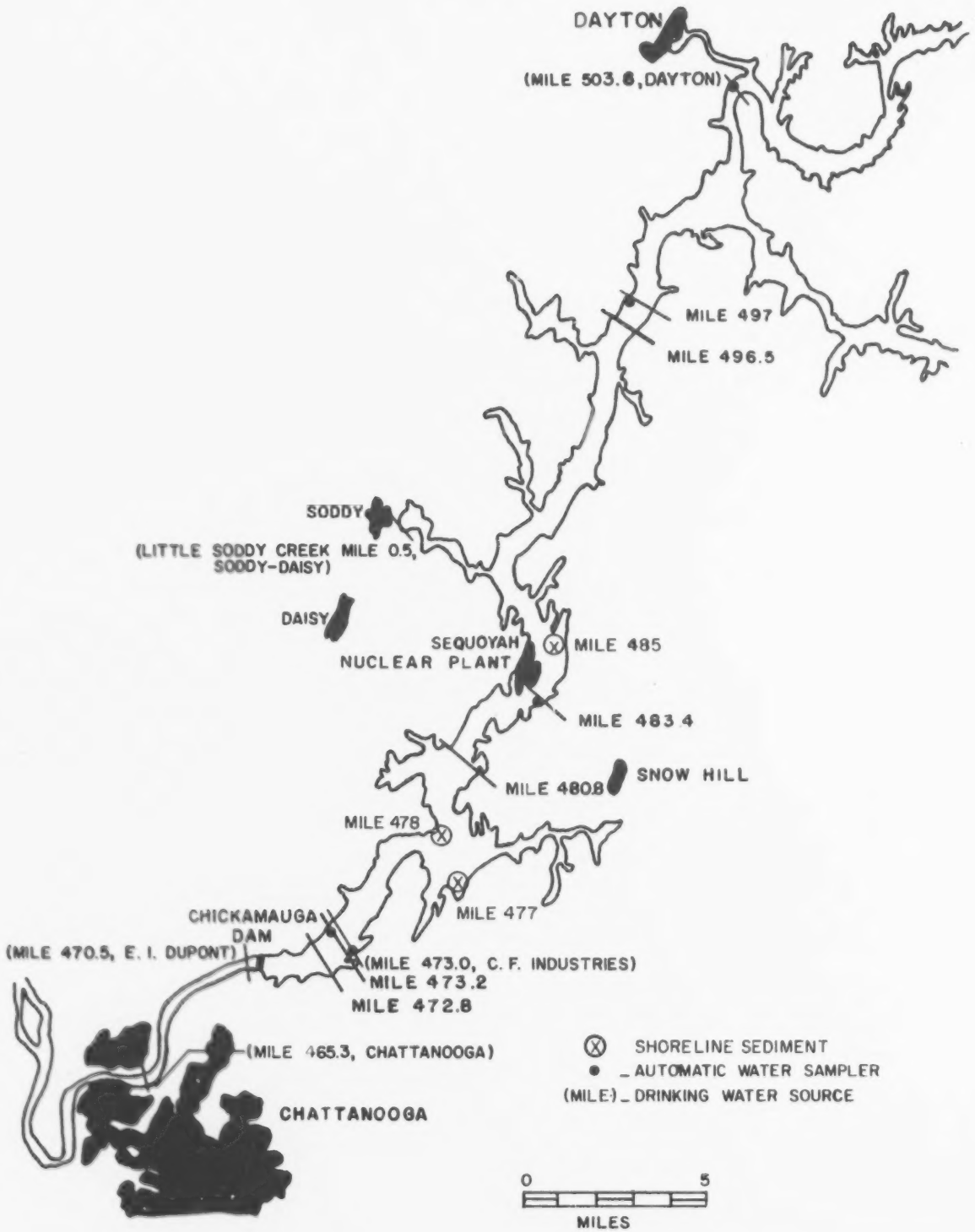

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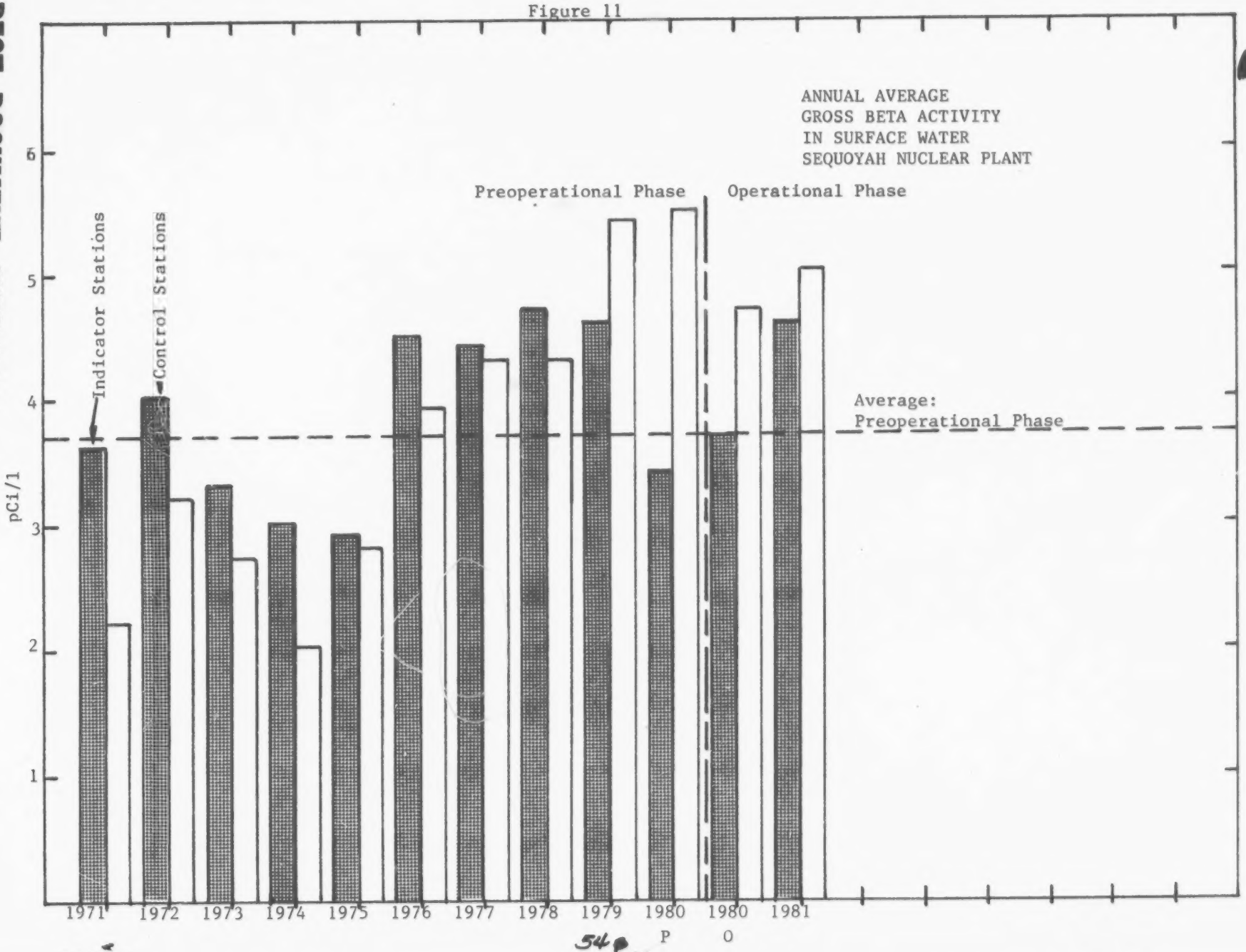
Figure 11



Quality Control

A quality control program has been established with the Tennessee Department of Public Health Radiological Laboratory and the Eastern Environmental Radiation Facility, Environmental Protection Agency, Montgomery, Alabama. Samples of air, water, milk, fish, and soil collected around nuclear plants are forwarded to these laboratories for analysis, and results are exchanged for comparison.

Data Analysis

Data measured at the control stations for each medium were averaged for each sampling period. In order to describe the distribution of control station data, a mean, standard deviation, and 3-sigma limits were calculated. We can expect that background concentrations would be distributed within these limits. This provides the basis for comparing control and indicator data. If the indicator data fall within the 3-sigma limits defined for control data, we conclude that the indicator data were not significantly affected by the nuclear plant. If the data do not fall within the limits, we will perform further analyses to determine if the difference is attributable to the nuclear plant.

Conclusions

A vast majority of the indicator station data was found to be within the distribution defined by the control station data. The data analysis software identified concentrations slightly exceeding the limits of the control station data for a small number of radionuclides in samples for indicator stations. Many of these values may be discounted because the error reported by the analysis program was greater than the calculated concentration. The remaining isolated, elevated concentrations may be the result of fallout, fluctuations in the existing environment, computer program artifacts, or analytical errors. The same type of isolated high values occurred in the control station data and may be attributed to the same sources.

Increased levels of radioactivity were observed in rainwater, air particulates, heavy particle fallout, and in vegetation in the winter and spring following the atmospheric nuclear weapons testing conducted by the Republic of China in mid-October 1980. This increase was seen in control stations as well as indicator stations. The primary radioisotopes identified in the atmospheric media from this test were ^{95}Zr, ^{95}Nb, ^{131}I, ^{140}Ba-La, and ^{103}Ru.

Dose estimates were made from concentrations of radioactivity found in samples of environmental media. Media sampled include, but are not limited to, air, milk, drinking water, and fish. Doses estimated for persons at the indicator locations were essentially identical to those determined for persons at control locations. Greater than 99 percent of those doses were contributed

by the naturally occurring radionuclide potassium-40, and by strontium-90 and cesium-137 which are long-lived radioisotopes found in fallout from nuclear weapons testing conducted over the last several years.

From the above analysis of the data and from the trend plots presented earlier, it is concluded that there were no measurable increases in environmental radioactivity attributable to the operation of Sequoyah Nuclear Plant during 1981.